NOT MEASUREMENT SENSITIVE

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IMPLEMENTATION GUIDE FOR USE IN DEVELOPING TECHNICAL SAFETY REQUIREMENTS

[This Guide describes acceptable, non-mandatory means for meeting requirements. Guides are not requirements documents and are not to be construed as requirements in any audit or appraisal for compliance with associated rules or directives.]

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U.S. DEPARTMENT OF ENERGY
Office of Environment, Health, Safety and Security

FOREWORD

This ~~Guide is approved for use by all~~ Department of Energy (DOE) ~~and National Nuclear Security Administration (NNSA)~~ Implementation Guide is available for use by all DOE components and contractors.~~ Throughout this Guide the use of the term DOE includes DOE and NNSA.~~

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DOE ~~Implementation~~ Guides are part of the DOE Directives System and are issued to provide guidance and supplemental information regarding the Department's ~~expectations of its~~ requirements as contained in rules, Orders, Notices, and regulatory standards. ~~Implementation~~ Guides also provide acceptable methods for implementing these requirements.

This Guide may be used by all contractors for DOE Hazard Category 1, 2, or 3 nuclear facilities, including contractors for the National Nuclear Security Administration (NNSA). Throughout this document, references to a "contractor" or a "DOE contractor" apply to a contractor for NNSA as well.

This Guide was developed in support of ~~Subpart B of~~Title 10 Code of Federal ~~Regulation (CFR)~~Regulations (C.F.R.) Part 830, *Nuclear Safety ~~Basis Requirements, and~~Management*. This Guide provides ~~guidance in meeting the provisions for~~ a complete description of what Technical Safety Requirements ~~defined in 10 CFR 830.205.~~ should contain and how they should be developed and maintained.

This revision of the guide provides new guidance on Technical Safety Requirements for Specific Administrative Controls, incorporates and addresses lessons learned, and makes clarifications and organization changes to improve usability.

This Guide ~~does not establish or invoke any new~~ imposes no requirements.

CONTENTS

~~1.~~1 INTRODUCTION

1.1 Purpose

This Guide provides information to assist in the implementation of 10 Code of Federal ~~Regulation (CFR)~~ Regulations (C.F.R.) §830.205 ~~of the Nuclear Safety Management Rule requires~~ , *Technical Safety Requirements*. More specifically, the Guide provides methods acceptable to the Department of Energy (DOE) for contractors ~~responsible for Hazard Category 1, 2, and 3 DOE nuclear facilities~~ to develop Technical Safety Requirements (TSRs~~). These TSRs identify the limitations to each~~) for Hazard Category 1, 2, and 3 nuclear facilities. The Guide imposes no requirements; however, a contractor following the analytical and drafting methods described below has assurance that compliance with 10 C.F.R. §830.205 is being achieved. The rule specifies in subpart B, App A, G.4, that "DOE Guide 423.X, *Implementation Guide for Use in Developing Technical Safety Requirements (TSRs)*, provides a complete description of what Technical Safety Requirements should contain and how they should be developed and maintained." Other methods may be used, provided the resulting TSRs meet the requirements of 10 C.F.R. §830.205 and perform their intended purpose of establishing the specific parameters and requisite actions for the safe operation of a nuclear facility.

1.2 Terminology

Most terms used in this Guide are defined in 10 C.F.R. Part 830 *Nuclear Safety Management*, DOE-~~owned, contractor-operated nuclear facility~~Standard (STD)-3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, and DOE-STD-1189-2008, *Integration of Safety into the Design Process*. Terms not defined in these documents will be defined in the text.

1.3 Overview

DOE's approach to ensuring the health and safety of the public with respect to nuclear safety is found in the provisions and appendices of 10 C.F.R. Part 830. Many of the concepts found in this rule are based on ~~the~~ regulatory approaches developed by the Atomic Energy Commission and later by the Nuclear Regulatory Commission (NRC). Those familiar with NRC's safety regulations will note that DOE's documented safety analysis (DSA) ~~and any additional safety requirements established for the~~ parallels NRC's safety analysis report. Similarly, DOE's TSRs parallel NRC's technical specifications.

Analyzing the safety features of an existing nuclear facility~~. Although not required by the 830 rule, there also may be a need to establish TSRs for safe operation of radiological~~ or a design for a new nuclear facility begins with development of the DSA. This process is guided by DOE-STD-3009 for DOE nonreactor nuclear facilities and supported by DOE-STD-1189 for new nuclear facilities or major modifications. The hazard and accident analysis guided by these standards identify safety controls/assumptions.

The ~~TSR rule requires contractors to prepare and submit~~ purpose of TSRs ~~for DOE approval. This Guide provides guidance in identifying~~is to ensure important ~~safety~~operating parameters ~~and developing the content for the TSRs that~~ are ~~required by 10 CFR 830.205.~~

~~Appendix A to Subpart B of the Nuclear Safety Management Rule specifies the types of safety~~ maintained within acceptable limits ~~(SLs), operating limits (OLs), surveillance requirements (SRs),~~and that safety structures, systems, and components (SSCs) and ~~administrative controls~~Administrative Controls (ACs) ~~that define the safety envelope necessary to protect the health~~are available and ~~safety of the public and workers. The TSR derivation chapter in the DSA is the key component that provides the basis for TSRs.~~

~~This Guide provides elaboration for the content of TSRs. In providing this guidance, it is recognized that the diversity of DOE facilities may necessitate varying degrees of emphasis to be placed on some of the TSR Sections, but the following guidance is~~able to perform their intended ~~to be generally applicable~~safety functions under normal, abnormal, and accident conditions.

The four appendices cover special topics. Appendix A provides an acceptable approach to the structure and format of TSRs. Appendix B provides examples of acceptable TSRs. Appendix C addresses the performance of Independent Implementation Verification Reviews (IVRs) of safety basis controls, while Appendix D offers methods for converting older safety requirements, such as technical specifications and operational safety requirements, to TSRs.

~~2.~~2 APPLICATION

The information contained in this Guide is intended for use by all Department elements, including the National Nuclear Security Administration (NNSA), and all contractors for DOE-owned or DOE-leased~~,~~ Hazard Category 1, 2, or 3 nuclear facilities or nuclear operations. This Guide provides a format that is effective in highlighting the important features of TSRs. An older format was described in the attachment to DOE 5480.22, *Technical Safety Requirements*, dated 2-25-92, which was superseded by 10 C.F.R. Part 830. If in place, the older format may be retained, but when the TSRs are significantly modified, the format in this Guide should be considered. This format is based on the NRC Technical Specification Improvement Program (TSIP), and is designed to aid the use of operations information by the operators. However, neither the older format nor the new TSIP format is required. Other guides and formats for the development of TSRs may be used to comply with the requirements of 10 C.F.R.830 Subpart B.

This Guide does not apply to~~ (a) ~~:

- activities ~~that are ~~regulated ~~through~~under a license issued by the ~~Nuclear Regulatory Commission (~~NRC~~) or~~;
- activities regulated by a State under an agreement with the NRC~~, ~~ (including activities certified by the NRC under ~~section ~~§1701 of the Atomic Energy Act of 1954, ~~as amended (Act); (b) ~~42 USC §2297f);
- activities conducted under the authority of the Director, Naval Nuclear Propulsion, pursuant to Executive Order 12344,~~ codified at Title 50 United States Code sections 2406 and 2511; (c) transportation activities that are regulated by the Department of Transportation (DOT); (d) activities conducted under the Nuclear Waste Policy Act of 1982, as amended, and any facility identified under section 202(5) of the Energy Reorganization Act of 1974, as amended; and (e) activities related to the launch approval~~

~~and actual launch of nuclear energy systems into space.~~ codified at 50 U.S.C. §§2406, 2511;

- ~~This Implementation Guide provides two different formats that are effective in highlighting the important features of TSRs. The older format is described in the attachment to DOE 5480.22, *Technical Safety Requirements*, dated 2-25-92. This directive was superseded by 10 CFR Part 830 and canceled by DOE Notice 251.42. The newer format, based on the NRC Tech Spec Improvement Program (TSIP), is designed to aid the use of the operations information by the operators.~~transportation activities regulated by the Department of Transportation;
- activities conducted under the Nuclear Waste Policy Act of 1982;
- any facility identified in §202(5) of the Energy Reorganization Act of 1974 (42 USC §5842); and,
- activities related to the launch approval and actual launch of nuclear energy systems into space.

However, neither the older format nor the new TSIP format is required. ~~Other formats may be used as long as they meet the content expectations of Appendix A to Subpart B of the Nuclear Safety Management Rule.~~

A contractor for an environmental restoration activity may follow the method in DOE-STD-1120-98 or successor document, and provisions of 29 ~~CFR~~ C.F.R. §1910.120 or §1926.65 for construction activities (see 10 ~~CFR 830~~C.F.R. Part 830, Subpart B, Appendix A, Table 2 ~~of Appendix A to Subpart B~~) to develop ~~the appropriate~~ specifications for hazard controls ~~(~~rather than ~~this TSR guidance) provided the~~ TSRs. This option is available when the activity involves either (1) work not done within a permanent structure or (2) ~~the~~ decommissioning of a facility with only low-level residual fixed radioactivity. ~~Implicit in this guidance is an understanding that reasonable efforts to remove radioactive systems, components, and stored materials have been completed and that the work does not prudently require the use of active safety systems or components designed to prevent or mitigate the accidental release of hazardous radioactive materials. DOE-STD-1120-2005, *Integration of Environment, Safety, and Health Into Facility Disposition Activities* also provides guidance that must be considered in the development of TSRs. Appendix D to this Guide provides guidance on performance of Implementation Verification Reviews (IVR) of Safety Basis Controls.~~

~~GENERAL INFORMATION~~

~~DOE requires a DSA of its nuclear facilities, TSRs, and facility-specific commitments made to comply with DOE rules, Orders, and policies as the principal safety bases for decisions to authorize the design, construction, or operation of Hazard Category 1, 2, and 3 nuclear facilities. The approved DSA and TSRs, the safety evaluation report (SER), and facility-specific commitments made to comply with DOE nuclear safety requirements constitute the nuclear Safety Basis and facility authorization from DOE for the contractor to operate the facility.~~

~~The safety requirements of 10 CFR 830.205 apply to all safety hazards for Hazard Category 1, 2, and 3 nuclear facilities and operations. Broad application of Section 830.205 to all hazards should ensure comprehensive risk management of all nuclear operations.~~

~~Nonreactor nuclear facilities may develop a TSR document for an entire facility or the facility may be divided according to process, with a separate segment of the TSR generated for each process. In any case, every portion of the facility that contains category 1, 2, or 3 quantities of material should be covered by the TSR. When a facility uses segmented TSRs, careful attention should be given to those systems, such as the building heating, ventilating, and air-conditioning (HVAC) that perform a safety function common to multiple processes. The multiple sets of TSRs must be developed based on the identified system interactions, and ACTION statements from one set should not be in conflict with safety of the other operations.~~

~~Contractors, in the preparation of DSAs, identify how the safety requirements of the Nuclear Safety Management Rule apply to a specific facility, and describe how the contractor undertakes to design, build, and operate the facility to be in conformance with the applicable statutes, DOE rules, and Directives to ensure facility safety. The analysis of operations and accidents defines the limits of safe operations, identifies the required performance of safety class and safety significant structures systems and components (SSCs), and describes any ACs or procedures that are necessary to meet the specific safety criteria for the facility. These limiting parameters are described in the DSA under "Derivation of Technical Safety Requirements" and provide the principal bases for the TSRs required by 10 CFR 830.205. The Department reviews the TSRs and decides whether or not to approve the TSRs as part of the nuclear Safety Basis for the facility. Facility operation is required to be in compliance with the Safety Basis established and described in the approved DSA and the operating conditions and limitations contained in the TSRs. The TSR document is a controlled document and should be maintained with an authorized users list and is maintained under change control. The users list should be defined in the TSR and should include operations and support personnel, as necessary, and the DOE approval authority.~~

The following documents provide additional information on the development of specifications for safety controls for onsite transportation activities:

- DOE Order ~~(O)~~ 460.1C, *Packaging and Transportation Safety*~~, dated 5-14-~~ (2010~~, or successor documents, and its companion Guide,~~);
- DOE Guide ~~(G)~~ 460.1-1, *Implementation Guide for Use with DOE O 460.1A, Packaging and Transportation Safety*~~, dated 6-5-97, provide requirements and guidance for safe management of transportation activities associated with shipments of DOE-regulated hazardous materials not of national security interest. DOE O~~ (1997);
- DOE Order 460.~~1-1A~~2, *Packaging and Transfer or Transportation of Materials of National Security Interest*~~, dated 4-26-04, or successor documents, and~~ (2010); and,
- DOE Manual ~~(M)~~ 461.1-1, Admin Chg 1, *Packaging and Transfer of Materials of National Security Interest Manual*~~, dated 9-29-00~~ (2000)~~, provide requirements and guidance for safe management of transportation activities associated with shipments of materials of national security interest. The requirements and guidance in these documents support the identification of the~~ .

3 BACKGROUND

DOE's nuclear safety requirements in 10 C.F.R. Part 830 "require the contractor responsible for a DOE nuclear facility to analyze the facility, the work to be performed, and the associated hazards and to identify the conditions, safe boundaries, and hazard controls ~~that are necessary for the safe management of the transportation activities. These controls should address all activities associated with packaging and transporting the material from one location to another.~~ necessary to protect workers, the public and the environment from adverse consequences. These analyses and hazard controls constitute the safety basis upon which the contractor and DOE rely to conclude that the facility can be operated safely." The first major step in establishing the safety basis of a nuclear facility is the drafting of a DSA. This document gathers together the information and analyses to be relied upon by DOE in authorizing the operation of any nuclear facility within the scope of the rule. DSAs (including Transportation Safety Documents) define the performance capabilities of SSCs, and personnel, and are aimed at confirming the ability of the SSCs, and personnel to perform their intended safety function under normal, abnormal, accident, and anticipated failure conditions. The approved DSA provides the analytical basis for developing and selecting limiting parameters to be set forth in or TSRs, the subject of this Guide.

~~**TECHNICAL SAFETY REQUIREMENTS GUIDANCE**~~

~~TSRs define the performance requirements of SSCs and identify the safety management programs used by personnel to ensure safety. TSRs are aimed at confirming the ability of the SSCs and personnel to perform their intended safety functions under normal, abnormal, and accident conditions. These requirements are identified through hazard analysis of the activities to be performed and identification of the potential sources of safety issues. Safety analyses to~~

~~identify and analyze a set of bounding accidents that take into account all potential causes of releases of radioactivity also contribute to development of TSRs.~~

~~Through analyses of the encompassing bounding accidents, the necessary safety systems and accident mitigating systems are identified and their characteristics are defined. Flowing from the analyses is information that provides the bases for controls, limits, and conditions for operation, known as TSRs. TSRs explicitly show this relationship. The content of the DSA must remain valid so that the Safety Basis of the facility, as implemented in operations through the TSR, remains valid. Therefore, there is a commitment to the process of unreviewed safety questions (USQs) regarding any proposed change to the facility or its operations as described in the DSA. Likewise, all changes to the TSR bases presented in the DSA (e.g., when the DSA annual update is performed) should be incorporated into the TSRs to ensure the information contained therein reflects the current Safety Basis of the facility.~~

~~Any proposed revision to a TSR should be examined to ensure the basis for the change is supported in the DSA. The TSR rule requires that such revisions be submitted to DOE for review with the basis for the proposed change. The change to the TSR must be approved by DOE before it is implemented.~~

~~Technical Safety Requirement Users~~

~~The prime users of TSRs are the facility operations personnel. They use TSRs to ensure the safety commitments identified in the DSA are observed in day-to-day operations.~~

~~TSRs are also used by facility support staff who are responsible for developing and implementing procedures and training programs.~~

~~TSRs play a key role in safety oversight for both the contractor and DOE. They provide the clear definition of the safety envelope imposed on the facility operations.~~

~~Derivation of 10 CFR 830.205 Technical Safety Requirements~~

~~The DSA required by 10 CFR 830.204 furnishes the technical basis for TSRs. For some facilities, other documentation such as the SER may provide additional safety controls or operating restrictions that should be reflected in the TSRs. The TSR derivation section in the DSA~~TSRs can be viewed as a distillation of the DSA's analytical results for the required performance of safety related SSCs and ACs. TSRs set forth the minimum acceptable limits for operations under normal and specified failure conditions and establish maintenance and surveillance requirements (SRs). In accordance with 10 C.F.R. 830, all TSRs written by operating contractors, and proposed changes thereto, must be reviewed and approved by DOE before nuclear operations can commence.

Typically, Chapter 5 of a facility's DSA identifies needed TSRs and their technical basis. Subsection 5.5, "TSR Derivation," is intended to provide a link between the safety analysis and the list of variables, ~~systems, components, equipment, and administrative procedures that must be controlled or limited in some way~~SSCs, and ACs that are necessary to ensure safety.

~~For existing facilities that have neither a DOE-approved DSA, nor DOE-approved technical specifications (TSs)/operational safety requirements (OSRs), the schedule for developing the TSR should be coordinated with the DSA upgrade so that the TSR will reflect the DOE-approved DSA.~~

~~In areas for which the DSA does not directly~~ In some cases, the DSA may not supply all of the ~~input for the TSR (e.g.,~~ technical details necessary for the development of a TSR. This situation may apply in areas such as maintenance and surveillance frequencies and ~~acceptance criteria),~~compensatory measures for systems out of service. In such cases, national and international codes, standards, and guides should be used ~~wherever possible~~if available. Where no code, standard, or guide is applicable, other documents ~~(e.g.,~~such as reliability analyses, failure modes and effects analyses, manufacturer documentation, ~~information from~~and data based on operating history~~, or~~ may be used, along with engineering judgment~~) may provide the basis.~~ .

~~**Technical Safety Requirement Minimization**~~

~~The process of developing a set of control parameters from the safety analyses does not necessarily lead to a minimum set of TSRs, particularly when the accident analysis has generated a large number of contributing sequences. However, there is great incentive in terms of operational flexibility and ease of use by operators to reduce the TSRs to the smallest number that will satisfy the safety criteria established for the facility. This task has never been simple and will continue to challenge even experienced professionals. Both the writers of the TSRs and the accident analyst should work together to ensure the TSRs represent the set of controls that are necessary to describe the bounds of safe operation.~~

~~**Conditions Outside Technical Safety Requirements**~~

~~In an emergency, if a situation develops that is not addressed by the TSR, site personnel are expected to use their training and expertise to take actions to correct or mitigate the situation. Also, site personnel may take actions that depart from the requirements of a TSR provided (a) an emergency situation exists; (b) these actions are needed immediately to protect workers, the public, or the environment from imminent and significant harm; and (c) no action consistent with the TSR is immediately apparent. Such action must be approved by a certified operator for reactor facilities or by a person in authority as designated in the TSRs for nonreactor nuclear facilities. (The designation of the person or persons should be done with their job title.) If emergency action is taken, both a verbal notification should be made to the responsible head of the field element and a written report made to the Cognizant Secretarial Officer (CSO) within 24 hours.~~

~~Administrative Control of Technical Safety~~The DSA, TSRs, facility-specific commitments, and the safety evaluation report (SER) constitute the nuclear safety basis and facility authorization from DOE for the contractor to operate Hazard Category 1, 2, and 3 nuclear facilities. Following approval of the DSA, TSR, and issuance of the SER, the nuclear safety basis must be fully and effectively implemented prior to the start of nuclear operations in accordance with 10 C.F.R. 830. An IVR should be conducted to assure the full and effective implementation. Appendix C is a recommended approach for the conduct of the IVR.

4 DEVELOPMENT AND CONTENT OF TECHNICAL SAFETY REQUIREMENTS

TSR development begins with the DSA, which identifies those parameters and SSCs that are to be controlled to ensure the safety requirements for the facility are met. An individual control may be governed by several different types of TSR, depending on the consequences associated with loss of the control. Low consequences may be dealt with by an AC, while high consequences may demand the use of an engineered control. The selection principles to be used are stated in Table 4 of Appendix A to 10 C.F.R. Part 830, Subpart B.

The output of the TSR development process is a set of TSRs for significant controls relied upon in the DSA. As required by 10 C.F.R. 830 §205(a)(2), this set of TSRs must be submitted by the contractor to DOE for review and approval prior to use. During operations, any violation of a TSR must be reported to DOE [10 C.F.R. 830 §205(a)(3)].

4.1 TSR Development - Inputs from the DSA

TSR development begins with compiling a list of controls identified in a given DSA that require TSR coverage. For DSAs prepared in accordance with 10 C.F.R. §830.204 using an acceptable methodology such as DOE-STD-3009, the list of controls should include all DSA commitments to provide TSRs for ACs and safety-class and safety-significant SSCs.

The following information from the DSA provide useful inputs in developing TSRs:

- Specific safety functions called out (e.g. functional requirements and associated performance criteria);
- Implicit analytical assumptions;
- SSC interfaces and conditions that define operability;
- Key physical parameters (e.g., temperature, pressure, or distance);
- Assumptions or parameters that define inspection requirements;
- Facility description, including process and activity descriptions (DSA Chapter 2);
- Hazard analysis tables (DSA Chapter 3);
- Hazard analysis discussion of events with significant potential for uncontrolled release of radioactive or other hazardous material or energy, and the controls available to prevent or mitigate such events (DSA Chapter 3);
- Hazard analysis discussion of the events identified as presenting a significant hazard to workers and the controls available to prevent or mitigate such events (DSA Chapter 3);
- Accident analysis of the events that challenge offsite evaluation guidelines, and the controls available to prevent or mitigate such events (DSA Chapter 3);
- Safety SSC descriptions (DSA Chapter 4); and
- TSR derivation description (DSA Chapter 5).

4.2 Determining the Type of TSR

Once the items to be included in the TSRs are specified, it is necessary to determine the TSR type appropriate for each item.

The specified types of TSRs are:

- Safety Limits
- Operating limits, subdivided into
  - Limiting Control Settings
  - Limiting Conditions for Operation
- Administrative Controls (including Programmatic and Specific Administrative Controls (SACs))
- Design Features

TSR preparers should select the TSR type most appropriate for the item under consideration using the subsequent guidance below. Once the TSR type for each relevant control is selected, TSRs should be written following the format offered in Appendix A of this Guide.

4.2.1 Safety Limits

Safety limits are defined as follows in 10 C.F.R. §830.3:

> "Safety limits means the limits on process variables associated with those safety class physical barriers, generally passive, that are necessary for the intended facility function and that are required to guard against the uncontrolled release of radioactive materials."

4.2.2 Limiting Control Settings

Limiting control settings (LCSs) are the "settings on safety systems that control process variables to prevent exceeding a safety limit" (10 C.F.R. §830.3). LCSs of instruments that monitor process variables are the settings at which protective devices actuate or alarms sound to alert facility personnel. An LCS includes specification of actions required when the limiting setting is exceeded. Assignment of an LCS also requires defining associated SRs that ensure continuous functioning of SSCs measuring the limiting setting or carrying out associated actions.

4.2.3 Limiting Conditions for Operation

Limiting Conditions for Operation (LCOs) are the limits "that represent the lowest functional capability or performance level of safety structures, systems, and components required for safe operations (10 C.F.R. §830.3)." They delineate the minimum conditions necessary to ensure that the initial conditions assumed in the analysis remain intact and operability of an SSC is verified or the conditions of a SAC are met. LCOs include specific actions to be taken if minimum conditions are not met and define associated SRs.

LCOs are specifically intended to cover safety SSCs and SACs identified in the DSA. Such SSCs might include, for example, a ventilation system providing negative pressure, fire detection and suppression systems, and criticality alarm systems. Such systems prevent or mitigate hazards to the worker, the public and the environment. Significant passive SSCs, such as a rated, sealed fire wall, may be covered by LCOs if they are explicitly relied upon in the DSA to mitigate a design basis event. In other cases, passive SSCs may be controlled as TSR Design Features.

4.2.4 Administrative Controls

ACs are "provisions relating to organization and management, procedures, recordkeeping, assessment, and reporting necessary to ensure safe operation of a facility" (10 C.F.R. §830.3).

Two types of ACs are used in nuclear facilities. The first type, termed a SAC, covers a single item of sufficient importance to be called out individually. When the DSA states that a SAC is relied on for safety, it should be the subject of a TSR. Guidance on the development and use of SACs is provided in DOE-STD-1186-2004, *Specific Administrative Controls*.

The second type of control, termed a *programmatic administrative control*, or AC, commits the facility operator to establish, maintain, and implement an element of a safety management program (SMP). Programmatic ACs frequently apply to safety programs such as radiation protection, criticality safety, fire protection, emergency preparedness, hazardous material safety, quality assurance, maintenance, and inventory control. ACs supporting effective safety administration covers generic topics such as facility procedures, contractor organization and management, safety reviews and audits, record keeping, operating support, minimum staffing, facility staff qualification and training, and TSR violations.

In some situations, the DSA may identify a SAC to implement the function of what otherwise would be an active SSC. This approach can be taken when flexibility in implementation is desired or when the SSC naturally falls under an area of routine programmatic supervision. Using a SAC as an expedient alternative to an engineered control should, however, be avoided. SACs may be acceptable for ensuring safe operation in some cases, but they generally do not have the same level of reliability associated with an Engineered Control.

4.2.5 Design Features

Design Features (DF) are "the design features of a nuclear facility specified in the Technical Safety Requirements, that, if altered or modified, would have a significant effect on safe operation (10 C.F.R. §830.3)."

DFs are normally passive characteristics of the facility, not subject to significant alteration by operations personnel, which accomplish their function without a change of state. Examples include shielding, structural walls, relative locations of major components, installed poisons, and special material.

4.3 TSR Document Organization and Development Guidance

A TSR document should have the following major sections:

- Front Matter
- Use and Application (Section 1)
- Safety Limits (Section 2)
- Operating Limits and Surveillance Requirements (Sections 3/4)

~~The facility must be operated in accordance with the provisions of a DOE-approved TSR. To ensure this is the case, the TSR and its appendices must be an administratively controlled document so that only current copies of the DOE-approved TSR are used for operation of the facility. Making the TSR controlled involves establishing a list of the copies of the TSR that serve as "official" copies and instituting a formal process for issuing and distributing these copies and incorporating DOE-approved changes into them.~~

~~**Public Safety**~~

~~An evaluation guideline defined in DOE-STD-3009-94, Change Notice 3 or successor documents, is used to classify SSCs as safety class to provide protection to the off-site general public from hazards associated with nuclear facilities. Safety analyses also lead to the classification of additional safety significant SSCs for defense in depth. TSRs ensure the availability of these features.~~

~~**Worker Safety**~~

~~DOE must ensure that its facilities are operated in a manner that protects workers. Safety significant SSCs can be identified for worker safety, as discussed in DOE-STD-3009-94, Change Notice 3 or successor documents. TSRs are intended to ensure the availability of these features. TSRs also can be established to require the implementation of ACs that have importance to worker safety.~~

~~Because of the necessary and inherent presence of hazardous and radioactive materials at DOE nuclear facilities and the workers' proximity to these materials, it is impractical to reduce worker risk to an insignificant level through selection of OLs as TSRs. Nevertheless, by the combination of (a) the development of TSRs for barriers to uncontrolled releases and for preventative and mitigative systems, components, and equipment and (b) identification of safety management programs that encompass additional worker safety features such as use of personal protective clothing and equipment, emergency protection programs, worker training, and drills, risk is significantly reduced and worker safety is enhanced.~~

~~**Technical Safety Requirement Organization**~~

- ~~The first section, "~~Administrative Controls (Section 5)
- Design Features (Section 6)
- Bases Appendix

The content and guidance for development of each of these major sections is discussed below. See Appendix A for structure and format details.

4.3.1 Front Matter

The front matter section of a facility TSR should consist of the following parts:

(1). Title page (with appropriate document classification)
(2). List of affected pages
(3). Table of contents
(4). List of tables and figures
(5). List of acronyms, abbreviations, and symbols
(6). Record of changes

The lists for tables, figures, and acronyms may not be required if none are contained in the body of the TSR document. The list of tables or figures is a simple three-column list with the first column being the unique figure or table number, the second column being the description or title, and the last column showing the page number where the item can be found.

Changes to the TSRs may be indicated by:

- a list of pages in effect with page number and date,
- a record of revision pages,
- sidebar changes in the TSR text, and
- page number, document number, and the revision number.

The acronym list should be as short as possible. An acronym should be used only where the term is repeated a number of times. Definitions of acronyms in the list should be verified to match the precise meaning of the terms as used in the TSR.

4.3.2 Use and Application~~,"~~

The Use and Application Section provides~~ the definitions and ~~:

> *The basic instructions* ~~necessary to understand and use the TSR. It was~~*for applying the safety restrictions contained in a technical safety requirement. The use and application section includes definitions of terms, operating modes, logical connectors, completion times, and frequency notations.* (Table 4, 10 C.F.R. Part 830, Subpart B, Appendix A)

The Use and Application section is placed first to provide the ground rules for use of the TSR before presenting any requirements~~, and is vital~~. This section will contain essential information for understanding the rest of the TSR. It should reference the DSA as necessary but should not be a tutorial on the entire facility.

This section of the TSR will be subdivided into subsections based on the complexity and nature of the TSR document itself. This section should include the following subsections:

- Definitions of Terms
- Operating Modes
- Logical Connectors
- Completion Times
- Frequency Notations

Definition of Terms

The ~~next four sections~~list of definitions should be alphabetically arranged in tabular form. When used in the TSR document, these terms should appear in all uppercase when the precise definition provided in the definition section is intended. The list of definitions should contain the more frequently encountered definitions found in TSRs. TSRs should be carefully reviewed to ensure that terms are used in ~~hierarchical order related to~~a manner consistent with the ~~roles they have~~definitions list. Terms used in ~~controlling hazards. SLs~~the TSR that are ~~the~~ in common parlance should not be listed.

Operating Modes

Operating Modes in the DSA represent the facility SSC configurations that preserve safety in different phases, or modes, of facility operations. Mode distinctions are determined by differences in process parameters or needed safety controls and equipment for different operational states.

Examples of mode definitions are found in Appendix A. The example modes show the operational distinctions that can be made. In the "safest mode," certain TSR requirements may not apply. For example, a TSR may apply only when specific operations are under way, and thus does not apply when these operations are shut down. However, for some nuclear facilities it may not be possible to define a mode where TSRs do not apply, as the hazard is always present. In that case, the safest mode is that which minimizes risk.

In general, requirements applicable in a given mode are required for all actions or conditions represented by this mode. The TSR writer should ensure that the mode requirements are in alignment with how the specific LCO control is credited in the DSA. For example, if a fire protection system is credited whenever material-at-risk (MAR) is within the nuclear facility, the LCO for the fire protection system should be applicable in all modes in which MAR is present.

Logical Connectors

Logical connectors are used in TSRs to discriminate between, and yet connect, conditions, required actions, completion times, surveillance, and frequency periods.

Completion Times

Completion Time is the amount of time allowed for completing a required action. It might be, for example, the time interval allowed for carrying out compensatory measures or restoration activities when an Action Statement has been entered.

Frequency Notation

The "Specified Frequency" typically consists of (a) requirements of the frequency column of each surveillance requirement, and (b) any notes in the surveillance requirement column modifying performance requirements. Sometimes special situations dictate when the SRs are to be met, as when an event triggers the need for a surveillance action. These special situations should be stated in the TSR document. Examples of frequency notations are found in Appendix A.

4.3.3 Safety Limits

Appendix A to Subpart B of 10 C.F.R. Part 830 describes DOE expectations for safety limits as follows:

> *The limits on process variables associated with those safety class physical barriers, generally passive, that are necessary for the intended facility function and that are required to guard against the uncontrolled release of radioactive materials. The safety limit section describes, as precisely as possible, the parameters being limited, states the limit in measurable units (pressure, temperature, flow, etc.), and indicates the applicability of the limit. The safety limit section also describes the actions to be taken in the event that the safety limit is exceeded. These actions should first place the facility in the safest], [most] stable condition attainable, including total shutdown (except where such action might reduce the margin of safety) or should verify that the facility already is safe and stable and will remain so. The technical safety requirement should state that the contractor must obtain DOE authorization to restart the nuclear facility following a violation of a safety limit. The safety limit section also establishes the steps and time limits to correct the out-of-specification condition.*

Safety Limits control important ~~because a violation of an SL has the potential to result in an~~process variables to prevent the uncontrolled release of radioactive materials ~~affecting the public. OLs, which include limiting control settings (LCSs) and limiting conditions for operation (LCOs), protect against exceeding SLs and can ensure availability of safety significant SSCs important to worker safety, while SRs support LCSs and LCOs by ensuring~~

~~operability of the associated equipment. The ACs section provides the assurance that the basic conditions assumed by the safety analysis are met. Finally, the Design Features section describes the passive design features that, if altered or modified, would have a significant effect on safe operation~~.

~~Size and Complexity of Technical Safety Requirements~~

~~Category A reactors and some highly hazardous nonreactor facilities are expected to have far more extensive TSRs than other facilities. This is because Category A reactors usually require a greater number of limits on operation and a larger number of safety-related systems for which limits must be established. Some highly hazardous nonreactor facilities may also have these characteristics. The number and complexity of the systems needed to maintain an acceptable level of risk may result in complex TSRs. TSRs are developed primarily to ensure proper operability of systems and to provide actions in the event that such systems become inoperable.~~

~~The scope and content of TSRs should be limited to include only the most important nuclear safety areas in order to make TSR documents more operationally useful for controlling facility safety. The TSR should be written in a clear, concise manner using language that is directed at the facility-operating organization.~~

~~Technical Safety Requirement Elements~~

~~The DSA identifies those parameters that must be controlled to ensure the safety requirements for the facility are met. However, the TSR writer must exercise considerable expertise to ensure the TSRs control the required parameters, do not result in conflicting requirements, and do not impose unnecessary restrictions on operations.~~

~~Even after the control parameters for TSRs have been chosen, several levels of TSRs may be selected to control a given parameter. There is a hierarchy to the selection process, with SLs providing protection against potentially high consequence events and ACs providing protection against lower consequence events and providing for safety management programs. Guidance for the use of various TSR elements, by facility type, is provided in the following discussion and in Table 4 of the Nuclear Safety Management Rule.~~

~~1.1.1.1 Technical Safety Requirement Limits~~

~~There are three types of limits identified by Appendix A to Subpart B of the Nuclear Safety Management Rule: SLs, LCSs, and LCOs. The intent of these limits is to ensure that the operating regime is restricted to the bounds of safe operation as defined by the safety analyses.~~

~~1.1.1.1.1 Specification of Safety Limits~~

~~SLs are limits on important process variables needed for the facility function that, if exceeded, could directly cause the failure of one or more of the passive barriers that prevent the uncontrolled release of radioactive materials, with the potential of consequences to the public above specified evaluation guidelines. "Needed for the facility function" means the process variable is operator controlled to accomplish the facility mission and, if the variable were left unchecked, would initiate an event that challenges the passive safety boundary. SL designation~~

~~is distinct to process events because other events, such as external or natural phenomena events, that may also challenge the passive safety boundary have no SLs because they are not under operator control.~~

~~Generally, containment/confinement should not be considered as barriers that require SLs because they are mitigative in nature. However, these systems should be considered in the development of LCOs. For reactors, typically these barriers are considered to be the fuel cladding and primary coolant system, including piping and pressure vessels.~~**Reactor Facilities.** Typical reactor limits of importance and possible candidates for SLs are those placed on primary coolant system pressure, primary coolant system temperature, and reactor power. For reactors without closed primary coolant systems (such as pool-type reactors), or with primary coolant systems that operate at essentially atmospheric pressure, the main candidates for SLs would be maximum reactor power and water temperatures. Generally, containment or/confinement systems should not be considered as barriers that require SLs because they are mitigative in nature. However, these systems should be considered in the development of LCOs because they typically provide important defense-in-depth or worker safety protective features. For reactors, typically these barriers are considered to be the fuel cladding and primary coolant system, including piping and pressure vessels. LCSs for reactors should include reactor trip system instrumentation set points. Reactor trip set-point limits should be selected to provide sufficient margin between the trip set point and the SL. This margin will ensure that the core and the reactor coolant system do not exceed SLs during normal operations and anticipated operational occurrences

~~For nonreactor nuclear facilities, the passive~~**Nonreactor Nuclear Facilities.** Possible candidates for safety limits are specific barriers, preventing the ~~uncontrolled release of radioactive and other hazardous materials are considered to be the process material boundary (shell casing, vessel, tank, etc.) closest to the source. Failure must be immediate and catastrophic upon reaching the failure value as opposed to a long-term degradation failure such as by wall thinning, chemical corrosion, etc.~~ accident or accidents for which maintaining the integrity of the barrier is necessary to protect public health. Limits of importance for non-reactor nuclear facilities ~~are~~tend to be facility~~-~~-specific, ~~but could~~though often may relate to physical variables such as pressure~~, combustible/flammable material limits,~~ and ~~process heat-up limits~~temperature.

~~1.1.1.1.2 Specification of Limiting Control Settings~~

LCSs define the settings on safety systems that ~~control process variables to prevent exceeding an SL.~~

~~LCSs for reactors should include reactor trip system instrumentation set points. The reactor trip set-point limits are the nominal values at which the reactor trips are set and should be selected to provide sufficient allowances between the trip set point and the SL. This allowance~~ will ensure ~~the core and the reactor coolant system are prevented from exceeding SLs during normal operation and anticipated operational occurrences.~~

~~LCSs of instruments that monitor~~ process variables ~~at nonreactor nuclear facilities are the settings that either initiate protective devices themselves or sound an alarm to alert facility personnel to take action to protect barriers that prevent the uncontrolled release of radioactive~~

~~materials. An LCS is only specified for a variable that also protects an SL.~~ remain within applicable SLs. For all facilities, LCSs should be chosen so that there is adequate time after exceeding ~~the~~a normal setting to correct the abnormal situation, automatically or manually, before an SL is exceeded.

~~In general, each item requiring an SL will also have control or alarm settings to ensure that the SL is not violated. However, only those control or alarm settings that are relied upon in the safety analysis would become LCSs in the TSR.~~

When developing TSR limiting values or set points based on the DSA, ~~remember~~the TSR developer should bear in mind that ~~the~~ values in the DSA are generally the exact values at which something is assumed to happen. ~~The~~Because the values and set points in the TSR are measured~~,~~ ~~so the DSA values must be adjusted before use in the~~ and hence have some margin of error, TSR ~~to ensure that the action assumed in the DSA actually occurs~~ set points should be chosen on the conservative side of the DSA assumptions. The adjustments should account for~~:~~ calibration uncertainty, instrumentation uncertainty during operation~~, instrument drift, and instrument uncertainty during~~ and accident conditions~~.~~, and instrument drift. The DSA and TSR developer, if not the same person, should work together to ensure that the DSA Hazard Analysis and Accident Analysis are preserved through compliance with the TSR.

~~1.1.1.1.3 Specification of Limiting Conditions for Operation~~

4.3.4 Operating Limits & Surveillance Requirements

When developing TSR limiting values or set points based on the DSA, the TSR developer should bear in mind that values in the DSA are generally the exact values at which something is assumed to happen. Because the values and set points in the TSR are measured and hence have some margin of error, TSR set points should be chosen on the conservative side of the DSA assumptions. The adjustments should account for calibration uncertainty, instrumentation uncertainty during operation and accident conditions, and instrument drift. The DSA and TSR developer, if not the same person, should work together to ensure that the DSA Hazard Analysis and Accident Analysis are preserved through compliance with the TSR.

4.3.4.1 Operating Limits

Appendix A to Subpart B of 10 C.F.R. Part 830 describes DOE expectations for operating limits as follows:

> *Those limits which are required to ensure the safe operation of a nuclear facility. The operating limits section may include subsections on limiting control settings and limiting conditions for operation.*

DOE's TSRs may not contain a separate section titled "Operating Limits." TSRs are typically written in a format that combines Operating Limits as LCS/LCOs in Section 3 with SRs in Section 4 in the facility's TSR document followed by the number and name associated with the group that yields LCS/SR and LCO/SR in Sections 3/4.x. LCS/LCOs define the limits that represent the lowest functional capability or performance level of safety SSCs or SAC required to perform an activity safely. SRs verify whether or not the minimum operability requirements of LCS/LCO-required safety equipment or parameters are satisfied.

~~LCOs should include the initial conditions for those design basis accidents or transient analyses that involve the assumed failure of, or present a challenge to, the integrity of the primary radioactive material barrier. Identification of these variables should come from a search of each transient and accident analysis documented in the DSA. The~~**4.3.4.2 Limiting Control Settings**

Appendix A to Subpart B of 10 C.F.R. Part 830 describes DOE expectations for limiting control settings as follows:

> *The settings on safety systems that control process variables to prevent exceeding a safety limit. The limited control settings section normally contains the settings for automatic alarms and for the automatic or nonautomatic initiation of protective actions related to those variables associated with the function of safety class structures, systems, or components if the safety analysis shows that they are relied upon to mitigate or prevent an accident. The limited control settings section also identifies the protective actions to be taken at the specific settings chosen in order to correct a situation automatically or manually such that the related safety limit is not exceeded. Protective actions may include maintaining the variables within the requirements and repairing the automatic device promptly or shutting down the affected part of the process and, if required, the entire facility.*

At a minimum, each individual LCS should contain a LCS statement, a mode applicability statement, action statements, and SRs.

LCSs should be based on, and specified in terms of, these three rules:

Rule 1: Compliance with an LCS is required in the modes specified.

Rule 2: Upon discovery that the instrumentation or interlock set point is less conservative than the required LCSs, the associated action should require that it be restored or adjusted to meet the LCS. Other actions should be specified (e.g., the time allowed, out of service, for resetting, test, maintenance, repair, or calibration.)

Rule 3: If an automatic safety system is not operable as specified, appropriate action should be described in the action statement to compensate. In the case of reactors, that action may take the form of a reactor shutdown and/or engineered safety feature initiation or adjustment. In the case on non-reactor nuclear facilities such action might be manual process shutdown or process adjustment.

4.3.4.3 Limiting Conditions for Operation

Appendix A to Subpart B of 10 C.F.R. Part 830 describe DOE expectations for limiting conditions for operation as follows:

The limits that represent the lowest functional capability or performance level of safety structures, systems, and components required to perform an activity safely. The limiting conditions for operation section describes, as precisely as possible, the lowest functional capability or performance level of equipment required for continued safe operation of the facility. The limiting conditions for operation section also states the action to be taken to address a condition not meeting the limiting conditions for operation section. Normally this simply provides for the adverse condition being corrected in a certain time frame and for further action if this is impossible.

Any safety class SSC providing a credited safety function in the DSA for an assumed accident or transient sequence should be included in the LCOs. Each LCO should be established at a level that will ensure the process variable is not less conservative during actual operation than was assumed in the safety analyses.- LCOs should also cover SSCs that either provide support for or actuate a system credited in the DSA. SSCs that support the safety function of another SSC may be covered by separate LCOs if that approach simplifies implementation. A common example of separate coverage is an emergency diesel generator providing backup electrical power to a credited ventilation system.

~~LCOs should also include those SSCs that are part of the primary success path of a safety sequence analysis, and those support and actuation systems necessary for them to function successfully. Support equipment for these SSCs would normally be considered to be part of the LCO if relied upon to support the SSCs function.~~

~~The primary success path of a safety sequence analysis is the sequence of events assumed by the safety analyses that leads to the conclusion of a transient or accident with consequences that are acceptable. Hence, any SSC providing a safety function in that assumed sequence should be included in the LCOs. Each transient or accident analysis that challenges the integrity of a radioactive material barrier, or involves its assumed failure, should be studied to compile a list of involved SSCs.~~

~~When an LCO is not met, action should be initiated within 1 hour (unless provided for differently in the ACTION statement) to place the facility in a mode in which the requirement does not apply. However, note that at nonreactor nuclear facilities, the LCOs that provide for monitoring for a breach of the barriers containing radioactive material are applicable in all modes. The ACTION statement in this case should be rapid restoration of the capability, or compensatory measures. Entry into a different mode should not be made unless all of the LCOs are met for that mode, except for the passage through a mode as required to comply with ACTION statements.~~

LCOs should be written in a user-friendly manner to assist an operator faced with adverse, stressful conditions. The LCO should communicate quickly and effectively the information needed by the operator to assess and properly respond to off-normal and accident conditions. The operator should be able to grasp quickly from looking at the LCO (a) what operating parameters/ conditions represent the lowest functional capability or performance for a specified required Limiting Condition, (b) how to measure or determine whether that parameter condition is met, and (c) what to do if a Limiting Condition is not met.

The following are good practices in LCO development:

(1). The TSR developer should consult with facility engineers and operating staff in the development of an LCO to ensure ease of implementation.

(2). Area applicability should be defined so that the LCO is only required for the facility areas for which it is credited. The TSR developer should consider whether subdivision of an area might ease implementation.

(3). The LCO should only be specified for limited processes if the accidents for which the control is credited applies only to certain processes.

(4). If the LCO is mode-specific, the conditions that must be maintained in those modes should be specified. For conditions that vary by mode, a separate LCO should be written for each mode. Placing the facility in a mode where the LCO is not applicable is always an option to consider. Once action is taken to enter a mode where the LCO is not required, the facility has exited the LCO.

(5). Multiple parameters grouped under one SR should be avoided, as it may be unclear which action to enter if the SR is not met. Parameters specified to be met must be measurable or readily determinable. Actions should be specified that are reasonable to perform within the required time specified. The TSR developer should also consider the conditions under which surveillances or actions need to be performed. Under normal conditions it might be reasonable to expect an operator to climb a ladder to shut a roof vent within 20 minutes. This action might be dangerous or impossible under actual fire conditions.

(6). One aid to LCO usability is to minimize the number of different conditions of operability. TSR developers sometimes minimize the total number of LCOs at the expense of individual LCO simplicity. One to three conditions are usually considered ideal for the user. When the number of conditions approaches or exceeds about six, the operator has difficulty grasping the entire LCO and it begins to become unwieldy. When the LCO becomes this complex, splitting it into two or more LCOs should be considered. Conditions could be split among systems/ subsystems, grouped by similar required actions or surveillances, or grouped by area. Conditions must always be grouped by mode such that all conditions apply to all modes specified in the applicability. If there are different requirements for different modes a separate LCO should be specified for each mode.

(7). Another way to simplify conditions is consolidation. This technique may be useful when all the conditions are the same except for one parameter such as MAR limits. In this case, a single condition can be specified with reference to a "look-up" table. This table should be placed directly below the condition or within the body of the TSR itself. Placing this table in the bases should be avoided and it should never reference an external document.

4.3.4.4 LCS/LCO Statement

LCS/LCO specification statements should be concise. The objective is to distill a clear, precise statement or specification of operability. Examples of such concise statements are as follows:

- The criticality alarm system shall be OPERABLE with two detection channels and an alarm set point for each detector set at less than or equal to 100 mR/hr.

- The exhaust ventilation system shall be OPERABLE with two exhaust fans maintaining flow greater than or equal to 2,500 cfm and two HEPA filter banks each with a removal efficiency greater than or equal to 99.9% for 0.3 micron particles or greater.

The LCS/LCO specification statement typically focuses on the most important SSCs and parameters therefore it may not be necessary to list all subcomponents. The list provided in the SRs demonstrates compliance with the LCO statement, except where key support SSCs have been assigned their own individual LCO. In some cases, concise LCS/LCO specification statements may lead to multiple LCSs/LCOs for the same equipment and modes. This is an acceptable outcome.

~~1.1.1.2~~ 4.3.4.5 Action Statements

~~ACTION~~Action statements should describe the actions to be taken in the event that an ~~OL~~LCO is not met. ~~Secondly, an ACTION~~An action statement should establish the steps and agreed upon time limits to correct the condition or conditions that are beyond the ~~TSR~~TSR's limits.

Action statements fall into three general categories:

- Restorative: The ~~ACTION~~action statement ~~for LCOs should state the action required to address the condition not meeting the LCO. Normally this simply requires the~~might provide that a certain adverse condition must be corrected in a certain time frame and ~~provides~~that further action ~~if this is impossible~~must be taken if corrective action cannot be taken in a stated amount of time. For example, if an LCO requires two pumps to be ~~OPERABLE~~operable at all times when in the ~~operation~~"normal operations" mode, the ~~ACTION~~action statement ~~would likely state~~might require that if one pump is inoperable, it ~~should~~must be made ~~OPERABLE~~operable in X hours or ~~the facility should be placed in warm standby mode~~ operations must cease within the following Y hours~~; if~~. If both pumps ~~were~~became inoperable, the ~~ACTION~~action statement would likely require cessation of operations and restoration of at least one pump ~~be OPERABLE in~~within Z hours and the second pump ~~OPERABLE in the following~~within W hours~~ or the facility~~.

- Eliminative: This type of action places the facility in a mode or condition in which the DSA credited safety function is no longer required. If such a mode or condition is not practical, the facility or operation may be placed in ~~warm standby mode.~~ a condition that reduces the probability of occurrence of the accident for which the safety function is credited in the DSA, for a limited period of time.

- ~~An ACTION~~Compensatory: This type of action replaces the lost safety function with another device or a manual action that substitutes for the unavailable safety function.

[Note: An action statement to merely develop a plan for corrective action is typically not sufficient because resolution of the condition is not accomplished until plan completion. Typically, an action statement to develop a plan would either require regulatory approval or be preceded by an action to either change modes or transition to a safer condition.]

An action statement should provide a ~~safe and unambiguous~~clear, logical method to reach a safe~~,~~ and stable state. ~~-~~However, ~~for~~in complex facilities~~, considerable~~ care ~~should~~must be ~~exercised~~taken to ensure that an ~~ACTION~~action statement does not ~~unacceptably~~inadvertently decrease safety.~~ Thus, ACTION statements should avoid causing a loss of safety function either directly or by making support systems inoperable.~~ Occasionally, it may be necessary for an ~~ACTION~~action statement to specify transition through an operating mode even though required safety equipment would be inoperable~~. For such cases the transition condition should be carefully evaluated to ensure that the facility's risk is not increased by the ACTION statement~~ for the transitional state.

~~The ACTION statement for nuclear criticality safety LCOs should normally specify that the process or activities not in compliance with the LCO should be stopped immediately (if this action would not result in a less stable condition) and the process, system, or area be restored to a safe condition in accordance with an approved recovery plan.~~

The general LCOs are used to provide additional actions when conditions or SR are not meet.

~~1.1.1.3~~ 4.3.4.6 Operability

Operability embodies the principle that ~~a system, subsystem, train, component, or device (hereafter referred to as the system)~~an SSC can perform its credited safety function(s) ~~only if all necessary support systems are capable of performing their related support functions.~~as described in the DSA. This ~~definition~~principle extends the requirements of an LCO for those ~~systems~~SSCs that directly perform a specified safety function (supported systems) to those that perform a required support function (support systems).~~-~~ Operability applies only to SSCs.

~~A system or component can be degraded but still OPERABLE if it remains capable of performing its required safety function at the level assumed in the accident analysis. If systems, components, or equipment are observed to be functioning but under stress (e.g., with elevated temperature, vibration, or physical damage), then judgment must be used concerning a declaration of inoperability.~~

~~General~~These general principles of operability should be followed in generating LCOs~~.~~:

- ~~GENERAL PRINCIPLE 1: A system~~An SSC is considered ~~OPERABLE~~operable as long as ~~there exists assurance that it is capable of performing its~~ its associated SRs are completed satisfactorily within the specified ~~safety function(s).~~timeframe.

- ~~GENERAL PRINCIPLE 2: A system~~An SSC can perform its specified safety function(s) only when all of its necessary support systems are capable of performing their related support functions.
- ~~GENERAL PRINCIPLE 3:~~ When all ~~systems~~SSCs designed to perform a certain safety function are not capable of performing that safety function, a loss of function condition exists.

~~GENERAL PRINCIPLE 4:~~

When ~~a system~~an SSC is determined to be incapable of performing its intended safety function(s), the declaration of inoperability should be immediate.

~~Allowable Outage~~

~~1.1.1.4~~ 4.3.4.7 Completion Times

~~Generally,~~

The format of an action statement consists of a condition statement, required actions, and completion times. Every required action in an operating limit (LCS/LCO) has a defined associated completion time. The completion time is the amount of time allowed for completing a required action. When developing TSRs, the safety importance of the lost safety function of the LCS/LCO and the risk of continued operations while the condition is not met (as described in the DSA) are important considerations in determining a proper completion time, with the most important required actions or highest operating risk conditions having the shorter completion times. The technical rationale for selecting a certain completion time should be provided in the bases.

Completion times should be specified in a manner that is either predefined or easily understood; for example, use of "7 days" versus use of "1 week". In establishing completion times in the TSR, caution should be exercised to prevent inadvertent continuous operation by alternating back and forth between conditions in an action statement without restoration of the system to meet the operating limit. Completion times begin at the time of declaration.

When an LCO is intentionally entered for maintenance or surveillance, the completion time is sometimes referred to as the allowable outage time (AOT~~) of a~~). Required actions and their associated completion times should be written to accommodate the maintenance or surveillances which are anticipated to compromise or degrade a systems capability to meet the conditions of the operating limit. The AOT of any support system should ~~be shorter than~~ensure the minimum ~~AOT of the system it is supporting.~~

~~In actual practice, however, situations may arise where the ACTION statements of a~~ functional operating requirements for the supported system ~~LCO specify required actions (other than restoration) that have completion times shorter than the support system's AOT. In most cases, upon failure to accomplish the required actions within the allowed completion time, the~~ and should not be longer than the allowable outage time of any of its supported ~~system LCO ACTION statements would require a mode change to one in which the operability of the supported system is not required. This would occur before the expiration of the support system's AOT.~~ systems.

~~1.1.1.5 Fire Protection; Heating, Ventilating, and Air-Conditioning; and Natural Phenomena Hazards Controls~~

~~Fire poses the most significant risk in some DOE facilities. For those facilities, certain key fire protection LCOs will need to be developed as dictated by the DSA accident analysis and the Fire Hazards Analysis (FHA) required by DOE O 420.1B, *Facility Safety*, dated 12-22-05, or successor documents. The TSR document may need to include a reference to general safety controls provided by the fire protection program, but it also needs to identify specific controls (usually LCOs) for any fire protection equipment that has been identified in the DSA as performing a safety function. Similarly, the HVAC systems and their filters may require TSRs for those elements of the system that have been identified with a safety function in the DSA. The natural phenomena hazard (NPH) assessment required by DOE O 420.1B may also result in controls (mainly related to NPH detection and warning devices) that should be incorporated into the TSR document.~~

~~1.1.1.6~~ 4.3.4.8 Surveillance Requirements

~~Surveillance~~ Appendix A to Subpart B of 10 C.F.R. Part 830 describe DOE expectations for SRs as follows:

> *Requirements ~~(~~relating to test, calibration, or inspection to assure that the necessary operability and quality of safety structures, systems, and components is maintained; that facility operation is within safety limits; and that limiting control settings and limiting conditions for operation are met. If a required surveillance is not successfully completed, the contractor is expected to assume the systems or components involved are inoperable and take the actions defined by the technical safety requirement until the systems or components can be shown to be operable. If, however, a required surveillance is not performed within its required frequency, the contractor is allowed to perform the surveillance within 24 hours or the original frequency, whichever is smaller, and confirm operability.*

SRs~~)~~ are used to ensure operability or availability of the safety SSCs and SACs identified in the ~~OLs~~Operating Limits. SRs are most often used with LCS/LCOs to periodically validate the operability of ~~active systems or components~~ SSCs that are subject to a limiting condition.

SRs consist of short descriptions of the type of surveillance required and ~~its~~the required frequency of performance. These statements should ~~be as brief as possible but should~~ identify those requirements needed to ensure compliance with the related OLs. ~~Each SR should begin with a verb. Use of terms and sentence structure among requirements should be consistent.~~

Failure to perform a surveillance within the required time interval, or failure of ~~a surveillance~~the SSC to meet ~~its~~ acceptance criteria ~~should result in the equipment/component/condition being~~ during surveillance tests, require that the SSC be declared inoperable ~~and should be considered a failure to meet the LCO. When equipment or a component fails the SR, the action required by the TSR for the inoperable equipment or~~

~~component should be taken. Failure to take the required action is a TSR violation. If an SR is not performed within its required time interval, including any extension allowed, it is considered to be a violation of the TSR. To avoid subjecting the facility to unnecessary transients, upon~~.

The TSR writer should consider developing general SRs that corresponded to the general LCOs (see Appendix B, Figures 6a and 6b, for examples). Upon discovery of a missed surveillance test, a grace period such as 24 hours or the time limit of the specified surveillance frequency, whichever is less, ~~is~~may be allowed to complete the surveillance before taking the required action of the LCO. Such ~~exceptions~~grace periods should be ~~clearly identified~~stated explicitly or may be stated generically in the ~~general SRs~~Use and Applications section of the TSR document. There may be process systems for which it is not acceptable to apply the concept of a grace period because failing to perform the surveillance or maintenance places the system in a state ~~that needs~~requiring immediate corrective action.

4.3.4.9 Surveillance Requirement Statements

SR statements consist of definitions of the type of surveillance required to verify operability of SSCs. Examples are as follows:

- Verify that the pressure in Room 27A is a minimum of 0.05 inch WG lower than the outside atmospheric pressure.
- Perform a channel functional test on each criticality alarm system detector using an external radiation source.

The total collection of SR statements associated with a given LCS/LCO should (a) confirm operability of required SSCs, and (b) maintain facility operations within LCS/ LCOs operating parameters.

4.3.4.10 Surveillance Requirement Frequencies

SR frequencies are direct statements of the time interval in which the surveillance must be performed. One-word statements such as weekly, monthly, quarterly, or annually are preferred. The interval can be based on specific DSA assumptions, national and international codes, standards, and guides, reliability analyses, failure modes and effects analyses, manufacturer documentation, information from operating history, or engineering judgment.

~~1.1.1.7~~ 4.3.5 Administrative Controls

~~Administrative Controls (~~Appendix A to Subpart B of 10 C.F.R. Part 830 describe DOE expectations for ACs~~) are the provisions relating to organization~~ as follows:

> *Organization and management, procedures, ~~record keeping, reviews~~recordkeeping, assessment, and ~~audits~~reporting necessary to ensure safe operation of ~~the facility. ACs may include reporting deviations from TSRs (i.e., exceeding LCOs, LCSs, or SRs, or violation of a TSR),~~a facility consistent with the technical safety requirement. In general, the*

administrative controls section addresses (1) the requirements associated with administrative controls, (including those for reporting violations of the technical safety requirement); (2) the staffing requirements for facility positions important to safe ~~operation~~conduct of the facility~~, ACs of~~; and (3) the ~~criticality safety program (see Section 4.13), and~~ commitments to the safety management programs ~~important to worker safety~~identified in the documented safety analysis as necessary components of the safety basis for the facility.

ACs can be "programmatic" or "specific." Programmatic controls describe safety management programs that are assumed in the DSA to be functional and properly maintained. SACs, identify requirements explicitly credited in safety analysis. In general, the ACs should document all those administrative functions that are required to meet facility safety criteria as identified in the DSA, including commitments to safety management programs.~~ It is expected that the ACs will be tailored to the facility activities and the hazards identified in the DSA. This tailoring should be a direct result of the DSA, but it may also result from institutional requirements that address many facilities. As a general practice, safety controls for individual accident scenarios based on engineered SSCs are preferred to ACs because they are usually more reliable and more predictable~~ ACs may include reporting deviations from TSRs, staffing requirements for facility positions important to safe operation of the facility, and commitments to safety management programs important to worker safety.

~~The tendency to use ACs as an expedient alternative to an LCO or LCS should be avoided when possible.~~ Efforts should be made to use engineered SSCs whenever possible for controlling the likelihood and consequences of accidents. ACs should be considered ~~for~~as defense in depth measures rather than ~~the~~as primary or redundant controls. While ACs may be acceptable for ensuring some aspects of safe operation, their generally lower reliability, compared with engineered controls, should be ~~evaluated carefully~~weighed when choosing safety measures for long-term hazardous activities.

Human actions, taken either in response to an event or taken proactively to establish desired conditions, are subject to errors of omission or commission. Sets of ACs are prone to common cause failure. The following attributes~~, which can be tailored as appropriate,~~ can increase human reliability:

- use of reader/worker/checker systems;
- independent verification;
- positive feedback systems;
- human factor analysis;
- operator training and certification;
- continuing training and requalification;
- abnormal event response drills;~~ and~~
- ergonomic considerations in procedures~~.~~; and
- conduct of operations.

When invoking ACs for control of accident scenarios, the preceding attributes, appropriate to the consequences of the accidents they are intended to prevent, should be considered ~~and also invoked~~.

4.3.5.1 Programmatic Administrative Controls

A programmatic AC represents commitments to establish, implement, and maintain a safety management program. Safety management programs that might be covered by an AC include quality assurance, procedures, maintenance, training, conduct of operations, emergency preparedness, fire protection, waste management, and radiological protection. ACs supporting effective safety administration cover generic topics such as facility procedures, contractor organization and management, safety reviews and audits, record keeping, operating support, facility staff qualification and training, and TSR violations. The cumulative effect of these safety management programs is recognized as being important to overall facility safety. For each safety management program, the DSA may specify key elements that: (1) are specifically assumed to function for mitigated scenarios in the hazard evaluation, but not designated an SAC; or, (2) are not specifically assumed to function for mitigated scenarios, but are recognized by facility management as an important capability warranting special emphasis. A TSR violation may be declared when a safety management program fails to a degree that renders the DSA summary invalid.

Where safety management programs or key elements are relied on to ensure a safety function required by the safety analysis, it is important to capture this information in the TSR document as appropriate. Programmatic ACs typically begin with the phrase, “A program shall be established, implemented, and maintained to ensure that . . .” For example:

> A radiation protection program shall be established, implemented, and maintained to ensure that radiation exposure to employees, subcontractors, visitors, and members of the general public is controlled in accordance with requirements of 10 C.F.R. Part 835.

Specifying key elements does not automatically convert those elements to SACs. Note that active SSCs are sometimes assigned to ACs as well. This can be done for non safety-class or safety significant SSCs when flexibility in implementation is desired or when the SSC naturally falls under an area of routine programmatic supervision.

4.3.5.2 Specific Administrative Controls

A SAC is identified in the DSA as an AC needed to prevent or mitigate an accident scenario. DOE-STD-1186 defines a SAC as an AC “that provides a specific preventive or mitigative function for accident scenarios identified in the DSA where the safety function has importance similar to, or the same as, the safety function of a safety SSC (e.g., discrete operator actions, combustible loading program limits, hazardous material limits protecting hazard analyses or facility categorization).”

SACs can be presented in the TSRs in either of two formats: *LCO/SR* or *Directive Action*. LCO/SR format should be used when SAC is well-defined, clear corrective actions available, and supporting conditions can be easily verified. Guidance for an SSC-related LCO/SR provided in Section 4.3.4 is applicable to an SAC written in LCO/SR format. LCO/SR format may be more appropriate and preferred for a SAC if:

- A clear distinction between when a SAC is met or not met.
- Specific surveillances are required.
- The actions to respond to an inoperable condition not met must be clearly spelled out.
- What constitutes a TSR violation for an LCO is better defined than for an AC.

Directive Action SAC format is used when it is essential that SAC be performed when called upon every time and without delay. A violation of a Directive Action SAC is an immediate TSR violation. DOE-STD-1186-2004 provides additional guidance and expectations for SACs.

Note: For Hazard Category 3 facilities, TSRs may consist solely of an inventory limit to maintain the Hazard Category 3 classification and other ACs that provide appropriate commitments to safety programs.

An example SAC: "TRU waste containers shall not be stacked more than two levels high, and the bottom of the second level shall be stored no more than 4 feet above ground."

4.3.5.3 Violation of Technical Safety Requirements

~~Although the TSR elements have an importance hierarchy, a TSR violation can occur for each type of TSR.~~

Appendix A to Subpart B of 10 C.F.R. Part 830 describes DOE expectations for the ACs section to address requirements for reporting violations of the TSRs."

Violations of a TSR occur as a result of the following four circumstances~~.~~:

- Exceeding an SL.
- Failure to complete an ~~ACTION~~action statement within the required time limit following exceeding an LCS or failing to comply with an LCO.
- Failure to perform a surveillance within the required time limit.
- Failure to comply with an AC statement.

~~Failure to~~ The following are two examples of "failure to comply with an LCO:" (1) an operation is performed that is prohibited by the mode the facility is in, and (2) a safety system is rendered incapable of performing its safety function (e.g., by maintenance) without entering the applicable LCO.

The following are two examples of "failure to comply with an AC statement ~~is a TSR violation when either the AC is directly violated, as would be the case with not meeting minimum staffing requirements, for example, or the intent~~:" (1) any single instance of a ~~referenced program is not fulfilled. To qualify as~~ failure to comply with a ~~TSR violation, the~~requirement in a directive action SAC, and (2) a failure to meet the intent of ~~the~~a referenced safety management program ~~would need to be~~that is significant enough to render the DSA summary invalid.

~~TSR violations involving SLs require the facility to begin immediately to go to the most stable, safe condition attainable, including total shutdown.~~

~~A grace period is sometimes provided to perform a missed surveillance (see paragraph 4.10.6 above) to provide time for the performance of the missed surveillance, thereby avoiding the need for a facility to take immediate, possibly unnecessary corrective action. Entering the grace period remains a TSR violation even though an immediate corrective action may not be required.~~

~~Technical Safety Requirement Format~~

~~Examples of acceptable TSR formats and the expected content for each type of TSR limit are provided in Section 5. Both the new three-column format and the older single-column format are acceptable. If a facility wishes to use another format for its TSR, the contractor may request DOE's permission to use it.~~

~~Criticality Technical Safety Requirements~~

~~In the development of the DSA, the evaluation of normal, abnormal, and accident conditions that could lead to the uncontrolled release of radioactive materials must be analyzed per 830.204(b)(3). Corresponding hazard controls must be derived per 830.204(b)(4). Therefore, for category 1 and 2 facilities, postulated accidents involving inadvertent criticality must be considered and corresponding controls (TSRs) established. The criticality control TSRs will be principally derived from criticality safety evaluations (CSEs) supporting the DSA hazard analyses.~~

~~A DSA considers all hazards, including inadvertent criticality, and TSRs include the appropriate controls. CSEs support the DSA. They and their resulting controls should be summarized and referenced in the DSA. The DSA also considers scenarios that might not be included in CSEs, such as common cause failures, and additional controls might be identified as necessary. Refer to Section 5.2.1.1 of the Implementation Guide for DSAs for a more complete discussion of criticality analyses and the DSA. The TSR includes controls so identified, including a commitment to a Criticality Safety Program. The basic requirements for the Criticality Safety Program are described in DOE O 420.1B or successor document. Depending on the situation, criticality-related TSRs would usually be design features, LCOs associated with active engineered features, or ACs. TSR-level controls should be identified on a case-by-case basis and should be developed according to the guidance in DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, dated July 1994, Change Notice 3, dated January 2000, or successor documents, with regard to the classification of controls.~~

~~Design features providing protection from inadvertent criticality need to be subject to periodic surveillance and configuration management to ensure they do not degrade to the point that they can no longer be depended on to perform their intended function. Maintenance of the design features relied on for criticality control can be accomplished by functionally classifying this~~

~~equipment as safety significant and invoking TSR mechanisms for surveillance and configuration management.~~

~~Technical Safety Requirements for Transportation~~

~~Hazard controls should be developed for both on-site and off-site transportation using a graded approach commensurate with the risk of the activity and consistent with the approach used to develop the Safety Basis.~~

~~Normally, all necessary hazard controls for on-site transportation are developed in the transportation safety document (TSD) (see DOE O 460.1C, *Packaging and Transportation Safety*, and DOE G 460.1-1, *Implementation Guide for Use with DOE O 460.1A, Packaging and Transportation Safety*). The TSRs should be developed from the TSD and would contain items such as—~~

- ~~allowable route(s);~~
- ~~vehicle speed limits;~~
- ~~packaging controls for each category of hazardous material;~~
- ~~loading and unloading controls, as applicable;~~
- ~~operator/worker qualifications; and~~
- ~~any other necessary restrictions based on the safety analysis.~~

~~The transportation safety provisions are described in DOE O 460.1C and DOE O 461.1, or successor documents, and their associated guidance documents. Usually, LCOs and ACs are the appropriate level of TSR for transportation safety controls. No SLs are expected for transportation activities, because there are no processes or activities in which the operator causes a process variable to be manipulated that, if left unchecked or uncontrolled, would result in catastrophic failure of a passive safety barrier. For example, there are no operator-initiated processes to increase temperature, pressure, electrical or mechanical insult to the cargo that could lead to catastrophic failure.~~

~~Off-site transportation of materials of national security interest is also subject to 10 CFR 830 requirements, through the designated safe harbors of DOE O 461.1, *Packaging and Transfer or Transportation of Materials of National Security Interest*, and DOE M 461.1-1, *Packaging and Transfer of Materials of National Security Interest Manual*. Because the Transportation Safety Documents (TSDs) for transport of these materials basically require compliance with Type A and Type B requirements under DOT hazardous material transportation regulations (49 CFR, parts 106–199), or the equivalent, no separate TSR provisions (from the on-site TSRs) are required for these transport activities. The required Type A and Type B robust shipping packages are designed to survive the extreme of normal transport environments and hypothetical accident situations (essentially 10 CFR 71 requirements).~~

~~**Safety Structures, Systems, and Components**~~

~~Safety class SSCs are those items relied upon to ensure the safety and health of the public. This may include radiation monitoring equipment and alarms. The distinction between what is Safety Class and what is not is made by the DSA or by other safety documentation. In general, Safety Class SSCs should have one or more associated TSRs to ensure performance of their safety function.~~

~~Systems that are identified in the DSA to operate and perform a safety function that is required in order to meet additional DSA safety criteria also need TSRs. Support systems for Safety Class SSCs would normally be considered to be Safety Class if they are relied upon to support a safety class function.~~

~~Each Safety Class SSC should have a corresponding TSR. SLs are, by definition, associated with passive physical barriers that prevent the release of radioactive materials. Passive Safety Class systems and components, even those associated with an SL, will generally be listed in the Design Features as opposed to LCOs. Active Safety Class systems and components will generally have associated LCOs to ensure operability. All of the SSCs may have surveillance and maintenance requirements depending on their function and characteristics.~~

~~Safety-Significant SSCs would be covered in the TSR document since their functions are important to defense in depth and/or worker safety. The coverage would likely be through an LCO or AC (e.g., through special treatment in a maintenance management program). Support systems for Safety-Significant SSCs should be considered safety significant. The decision to use an LCO or an AC will depend on the facility, the nature of the control, the characteristic of the hazard and the availability of applicable programmatic documents.~~

~~The TSRs should derive from the identified component and system functional attributes that are important to implementing safety controls.~~

4.3.6 Design Features

Appendix A to Subpart B of 10 C.F.R. Part 830 describe DOE expectations for Design Features as follows:

Design ~~**Features**~~

> ~~The Design Features section describes those design~~ *features of the facility that, if altered or modified, would have a significant effect on* ~~the~~ *safe operation.* ~~The important attributes~~

Design Features (DFs) specify the inherent characteristics or qualities of an object or component required to protect the ~~passive design features that are taken credit for in~~validity of the DSA accident ~~analyses should~~analysis. DFs may be ~~described completely. These Design Features are normally passive~~intrinsic characteristics—such as enrichment, neutron absorption, fire rating, and load capacity—or physical characteristics such as siting, berms, and fueling locations.

DFs are normally passive attributes of the facility not subject to ~~change~~significant alteration by operations personnel~~, e.g.,~~. Examples of passive attributes include shielding, structural walls, relative locations of major components, installed reactivity poisons, or special materials.~~ Active safety features (see Section 4.15, above) are normally described in the DSA and are the subject of the various TSRs, so they are not normally described in the Design Features section. All changes or modifications that impact the Safety Basis of the facility are subject to the USQ process. The Design Features~~ The DF section captures those permanently built-in features critical to safety that do not require, or infrequently require, maintenance or surveillance.~~-~~ The attributes of the passive DFs that are important in the DSA should be described completely. Active safety features that are controlled by other types of TSRs should not be included in the DF section.

~~**Graded Approach**~~

~~The graded approach is not directly applicable to the TSRs required by 10 CFR 830.205. However, the graded approach is specified for DSAs required by 10 CFR 830.204. Thus, the level of detail in the DSA and the number of safety parameters identified in the DSA section deriving the TSRs will have a direct effect on the number and type of resulting TSRs.~~

~~Technical Safety Requirements~~Methods necessary to ensure DF are available as credited should be identified. Some DFs have the potential to be degraded by the effects of aging. Surveillance requirements for DFs are typically located in programs such as configuration management or in-service inspections (ISIs). It is appropriate to consider inclusion or reference to applicable ISIs for DFs in section 6 of the TSR.

4.3.7 Bases Appendix

~~The TSR~~Appendix A to Subpart B of 10 C.F.R. Part 830 describes DOE expectations for Bases Appendix as follows:

> *The reasons for the safety limits, operating limits, and associated surveillance requirements in the technical safety requirements. The statements for each limit or requirement shows how the numeric value, the condition, or the surveillance fulfills the purpose derived from the safety documentation. The primary purpose for describing the basis of each limit or requirement is to ensure that any future changes to the limit or requirement is done with full knowledge of the original intent or purpose of the limit or requirement.*

Although Part 830 requires that a basis be provided only for “safety limits, operating limits, and associated surveillance requirements,” technical basis for other aspects of TSRs. e.g. Design Features and SACs may be provided when practical.

The bases appendix provides summary statements of the reasons for the selection of each specific SL, OL, and SR. The bases ~~show how~~appendix should summarize and reference any more specific analyses related to the ~~numerical values, conditions, surveillances, and ACTION statements fulfill the purpose derived from the safety documentation. Included in the~~ TSRs and their derivation. The bases should ~~also be~~ (a~~ description of~~) describe the credited safety functions in the DSA that each safety system or SAC provides~~ and identification of~~, (b) identify what is included in each safety system~~. The level of detail in the description should be~~

~~sufficient for the operations staff to confirm that the system is OPERABLE. This description is provided so that the operations staff knows exactly what must be OPERABLE to consider the entire safety system OPERABLE. The bases appendix references the basis for specific parts of the TSR given in the DSA and other safety documentation.~~

~~The bases appendix should present all conditions of operation, including limiting accident conditions. All systems, subsystems, components, structures, and equipment that are to be included in the TSR should be presented or referenced to other DSA chapters and discussed in this appendix.~~

~~The derivation of TSR chapters from the DSA provides guidance mostly on information that exists or is referenced in the DSA itself. Other guidance information needed for development of TSRs, but not usually found in the DSA itself (e.g., action completion times and surveillance test frequencies) should be developed from national standards, manufacturer's recommendations, operating history or engineering judgment.~~

~~The TSR bases should include the following.~~

- ~~Identification of any~~ or SAC, (c) identify all requirements relevant to the ~~Safety Basis~~safety basis that ~~have~~has been selected ~~by the facility or imposed on the facility by DOE.~~

- ~~Identification of~~, and (d) identify specific information from the DSA used in the derivation of individual TSRs~~, including operating conditions limiting accident initial conditions, relevant parameters~~. The level of ~~safety class or safety significant SSCs, instrumentation, operator actions, assumed limits, and design features.~~

~~As discussed~~detail in the ~~"TSR Document of Example Technical Safety Requirements, Vol. 1: Examples," Rev. 1, dated February 2001,~~descriptions should be sufficient for the ~~content of~~operations staff to confirm that the system is operable or that a SAC is met. The bases appendix can ~~be broken~~conceptually divided into seven areas: background, ~~applicable~~application to safety analysis, SLs and OLs, mode applicability, ~~ACTION statements~~Action Statements, SRs, and references~~. Each of these areas is discussed in the following paragraphs.~~ :

~~1.1.1.8~~ Background

- ~~The~~. Discuss in a general way the function of each system~~ or~~, component ~~should be discussed and a description provided in what might be called the "background."~~ or SAC. Include~~, if they relate to the requirement being covered,~~ relevant major components and a schematic (if a system), operational aspects, unique features, and general design features. ~~In addition, the limits~~ Limits protected by the requirement, and the consequences of exceeding the ~~limit~~limits should be discussed. This ~~area~~section should also ~~contain any~~ cross~~ referencing to other~~-reference related or similar requirements.

~~1.1.1.9 Applicable~~ Application to Safety Analysis

- . Discuss the ~~applicable safety analysis and~~ evaluations included in the safety analysis from which the requirement has been derived, including~~—~~:
  - applicable accident or transient;
  - major input assumptions of the safety analysis;
  - ~~the~~ relationship of this TSR to the accepted consequence of the analysis; and
- ~~the~~ basis of each SL or OL, including any allowances~~; and~~
  - ~~the margin~~ or margins of safety ~~for each SL and OL. The margin of safety discussion should address such factors as LCS, LCO, design parameters, equipment trip set points, response time, instrument errors, completion times, and surveillance test frequencies.~~ specified in the DSA.

~~1.1.1.10 Safety and Operating Limits~~

SL or OL. For SLs, identify ~~from~~in the DSA the specific barrier protected by the SL and the accident or accidents for which maintaining the integrity of the barrier is necessary to protect public health~~.~~

- and safety. For LCSs or LCOs, explain why the requirement is ~~appropriate~~suitable. Discuss how it was determined to be the ~~lowest~~minimum functional capability or performance level for that system or component to ensure safe operation of the facility. Discuss any other relevant facets of the LCS or LCO ~~that may be required~~, such as conditions required, numbers of components required, parameter requirements, exceptions or notes, and implications of LCS or LCO violations.

~~1.1.1.11~~ Mode Applicability

- ~~Information~~ **.** Present information on expected and distinguishable operational conditions ~~(e.g., start-up, operation, shutdown) that establish sufficient unique or distinguishing characteristics~~suitable to ~~permit development of TSR~~be considered in separate modes ~~must be presented. Many DSAs do not categorize accident analysis by modes. Therefore, mode applicability should be developed from a synthesis of information from the DSA (e.g., accident or hazard analysis; facility description; testing, surveillance, maintenance, facility mission).~~ .

~~For mode applicability, explain why operability is required in the given modes and why operability is not required in other modes (or provide a reference to another requirement that covers other modes). Discuss credible events addressed in various modes, conditions encompassed by safety analysis, related LCOs, and the relationship of the requirement to other modes, and variations in requirements between modes.~~

~~1.1.1.12~~ Action ~~Statements~~

- **Statement.** For each ~~ACTION~~action statement~~—~~:
  - Explain why the ~~action~~actions should be taken and why continued operation is acceptable if the LCS/LCO is not met~~.~~;
  - ~~1.~~ Address the level of protection provided, the probability of an event occurring during the period covered, and how the required actions compensate for LCS/LCO deviations~~.~~;
  - ~~2.~~ Explain ~~why~~the technical basis for completion times~~ are acceptable.~~;
  - ~~3.~~ Describe why mode changes are required~~.~~;
  - ~~4.~~ Discuss how all required actions for an LCS/LCO relate to each other~~.~~;
  - ~~5.~~ Explain the source of all ~~numbers in the ACTION statements (e.g.,~~numerical values such as completion times, parameter values, ~~or~~and component requirements~~).~~.

- ~~1.1.1.13~~ **Surveillance ~~Requirements~~ Requirement.** For each SR:
  ~~Explain why the SR is necessary at the frequency specified.~~
  - Discuss how the surveillance demonstrates operability of the LCS/LCO requirements~~.~~;
  - Discuss how the surveillance verifies the LCS/LCO requirements; this discussion should establish a one-to-one correspondence between each SR and LCS/LCO~~.~~;
  - Explain why the SR is necessary at the frequency specified; and
  - Provide justification for surveillance test frequencies~~ (e.g.,~~, using, engineering judgment~~, or Probabilistic Risk Assessment [PRA])~~ or probabilistic risk assessment and parameter values. ~~Referencing national consensus standards may not be adequate basis without explaining the appropriateness of the application to the nuclear facility activity.~~

~~1.1.1.14~~ References

~~For References, supply the~~. In all sections of the TSR, identify the applicable DSA section, applicable reports~~ as applicable~~, and relevant codes and standards~~ as applicable. Provide~~. It is good practice to provide a list of documents where more detailed information pertinent to the ~~specification~~ TSRs can be found.

~~Revisions to the bases sections can be made without DOE approval if the changes are editorial in nature and do not make significant changes.~~

~~Review and Audits~~

- ~~The method(s) established to conduct facility staff reviews~~ For any reference cites, consider providing the full title, date, and~~/or independent reviews and audits should be described. The methods may take a range of forms acceptable to DOE. These may include creating an organizational unit, a standing or ad hoc committee, or assigning individuals capable of conducting these reviews and audits. If deemed necessary, such~~

~~reviews should be performed by the review personnel of the appropriate discipline. Individual reviewers should not review their own work or work for which they have direct responsibility. Regardless of the method used, management should specify the functions, organizational arrangement, responsibilities, appropriate ANSI/ANS 3.1-1981 qualifications, and reporting requirements of each functional element or unit that contributes to these processes.~~ revision number.

~~Reviews by an independent review and audit group should include proposed changes to the TSR. This review should cover the entire content of the TSR change including any safety analysis done in support of the change. Audits by the independent review and audit group should include conformance with TSR. Conformance can extend to maintenance of current documentation supporting the TSRs as well as adequacy of the TSRs to cover ongoing activities.~~

~~Appendix D to this Guide provides guidance on performance of Implementation Verification Reviews (IVR) of Safety Basis Controls.~~

~~Reporting Requirements~~

~~Reporting of all TSR violations (see Section 4.11, above) should be made in accordance with the provisions of DOE O 231.1A Chg 1, *Environment, Safety and Health Reporting*. The reporting of violations on ACs can involve judgment since the details of programs such as a program for criticality control do not appear directly as a TSR, and some program requirements are more important than others. Violations of controls identified in the accident or criticality scenarios in the DSA should be reported as if they were TSR violations. To ensure consideration for mitigation in potential enforcement actions, identified TSR violations should be evaluated for voluntary reporting to the DOE Noncompliance Tracking System.~~

~~Implementation Verification Reviews (IVR) of Safety Basis Controls~~

~~Appendix D to this Guide provides guidance on performance of Implementation Verification Reviews (IVR) of Safety Basis Controls.~~

~~ACCEPTABLE METHODS~~

Appendix A: Structure and Format of TSRs

This section provides guidance on the recommended structure and format of TSRs. ~~It is divided into three sections: Organization, Content, and Format.~~

Section ~~5.~~1~~, Organization,~~ presents a suggested organization to meet the requirements of the TSR rule and provides details to assist in unifying the TSR document. Section ~~5.~~2~~, Content, presents~~ delineates the suggested content for each of the ~~sections of the TSR. Section 5.3, Format, provides two suggested TSR formats. Examples are provided to illustrate various parts of a TSR. Additional examples of TSRs for specific types of facilities have been developed by the DOE Office of the Deputy Administrator for Defense Programs (NNSA).~~TSR sections.

1 Organization

~~1.1.1.15~~ 1.1 Front Matter

Front matter should consist of the following parts. Note: all figures referred to below are found in Appendix B.

- ~~1.~~ Title page.~~-~~ The title page should include, at ~~least~~a minimum, the name of the ~~reactor or nonreactor nuclear~~ facility, the facility location, the words “Technical Safety Requirements,” and the name of the responsible contractor.

- ~~2.~~ Table of Contents. ~~-~~The table of contents should list every item in the volume ~~(see Figure 1 for a reactor facility example and Figure 2 for a nonreactor nuclear facility example).~~.

- ~~3.~~ Tables. ~~-~~A list of tables should be included ~~(see Figure 3 for a reactor facility example and Figure 4 for a nonreactor nuclear facility example).~~ .

- ~~4.~~ Figures. ~~-~~A list of figures should be included ~~(see Figure 5 for a reactor facility example and Figure 6 for a nonreactor nuclear facility example).~~.

- ~~5.~~ Acronyms. ~~-~~A list of acronyms, abbreviations, and symbols should be compiled and included. ~~Acronyms, abbreviations, and symbols that appear~~ An acronym, abbreviation or symbol should not be created for a name or term used only ~~one time~~a few times in the ~~text should not be used or appear in the acronym list, rather they should~~document. When a short form reference is to be ~~“spelled out” in the text. Acronyms, abbreviations, and symbols~~ used ~~more than one time in the text,~~, it should be ~~spelled out at the~~defined on first ~~occurrence, with the acronym, abbreviation, or symbol following in~~ use by means of parentheses. Thereafter, the ~~acronym, abbreviation,~~short form of the name or ~~symbol~~term should be used.

~~1.1.1.16~~ 1.2 Arrangement of Sections

The main body should include the following sections in the order indicated.

- ~~6.~~ Section 1—Use and Application

~~1.~~• Section 2—Safety Limits

~~2.~~• Section 3/4—Limiting Control Settings, Limiting Conditions for Operation, and Surveillance Requirements. Section 3 ~~is~~covers LCS and LCO operational limits, ~~and~~ Section 4 ~~is~~covers surveillance requirements.~~ SRs are established to demonstrate and ensure the LCS and LCO operational limits are met.~~ These ~~two sections are thus intimately related. They~~three TSR aspects are presented together ~~in the text of the TSR document because of this relationship. Such presentation makes it easier to ensure SRs are appropriate for the related LCS and LCO operational limits~~to show the interconnections among them. The three-column format retains the same LCO and LCS number for related SRs~~.~~

~~3.~~• Section 5—Administrative Controls

~~4.~~• Section 6—Design Features

~~A cover page with the section number and title centered on the page should precede each section.~~

~~1.1.1.17~~ 1.3 Appendices

Appendices ~~should be placed at~~appear last in the ~~end of the~~TSR document~~. This Guide recommends using alphabetical designators for each appendix (Appendix A, Appendix B, etc.)~~ and ~~a cover page with the~~are identified by letter~~ designator and title. The appendix that~~. Appendix A contains the TSR bases~~ should be first (Appendix A).~~.

2 Content

The recommended content for each section of the TSR is described in the following paragraphs.

~~1.1.1.18~~ 2.1 Section 1—Use and Application

This section should contain basic information and instructions for using and applying the TSR. The following elements should be addressed under separate headings~~ in this section~~.

~~5.~~1. Definitions. ~~-~~Provide an alphabetical list of terms used throughout the TSR and their corresponding definitions (see Figure ~~7~~3). Include a note on the first page of the list stating that defined terms appear in uppercase type throughout the TSR.

~~6.~~2. Operational Modes (Reactors). ~~-~~In the interest of uniformity, the operational conditions or modes listed below are preferred and an attempt should be made to fit each reactor facility into this scheme. If, however, a reactor facility cannot be made to fit, modes may be defined as needed, provided the definition is clearly written with definite lines of demarcation between modes. The number of modes should be held to a minimum. The number of modes should be established based upon the minimum number required to be able to distinguish between different facility conditions and to ensure the provision of an adequate level of safety while in each condition.

Define ~~the~~ operational modes for reactor facilities~~ as follows.~~, for example:

- Operation Mode.- To be in operation mode, the reactor is critical and may be at any power level up to and including maximum allowed power.

- Start-up Mode. -To be in start-up mode, the reactor will begin in a subcritical state and be intentionally made to increase reactivity in a controlled manner to achieve a critical condition and to increase flux in an exponential manner until a low power is reached. Specific low power values are usually associated with the onset of measurable heat.

- Standby Mode. -To be in standby mode, the reactor is subcritical, but capable of operation without substantial administrative or mechanical actions.- K_{eff} limits or other limits needed to define the mode should be included.

- Shutdown Mode.- To be in shutdown mode, the reactor is significantly subcritical and capable of operation only after completing substantial administrative and/or mechanical actions. Normally, this would be a procedure or series of procedures (such as multiple system valve lineups) that should be performed, but it could be mechanical or electrical repairs, calibration, or other activity. The K_{eff} values should normally be included, unless they are of no use for a particular reactor, in which case control rod positions or other appropriate means should be defined for "significantly subcritical." (This is to be understood to refer to reactor shutdown, not facility shutdown.)

- Refueling Mode. -To be in the refueling mode, the reactor vessel integrity is breached (in all non-accident conditions), or any core alterations including fuel rods, control rods, targets, or other vessel internals are occurring or have occurred. Normally this mode requires major mechanical and associated administrative steps be completed before operation is possible.

Submodes may be created and defined as needed by reactor facilities. The definitions should be clearly written with numerical or other definite demarcation between submodes. The number of submodes should be limited as much as possible to avoid complexity and potential confusion.

Normally, the definition of the modes in a TSR document will be a summary of the definitions above with whatever additional information is needed for a particular reactor ~~(e.g., maximum allowed power, in the definition of operation mode).~~.

~~7.~~3. Operational Modes (Nonreactor Nuclear Facilities).~~ In the interest of uniformity, the operational conditions and modes listed below are preferred and an attempt should be made to fit each nonreactor nuclear facility into this scheme. If, however, a nonreactor nuclear facility cannot be made to fit, modes~~ Modes may be defined as needed, provided the definitions are clear and there are definite lines of demarcation between modes (such as a numerical value of pressure, temperature, or flow). The number of modes should be established based on the minimum number required to distinguish between different facility conditions as dictated by required equipment operability and needed parameter limits. If a mode is not used in the LCOs (except for the safest mode) or if it doesn't have different equipment or parameter limits specified from other modes, then it shouldn't be a mode.

Define the operational modes for nonreactor nuclear facilities ~~as follows.~~, for example:

- Operation Mode. ~~To be in operation mode, the~~The mission of the facility or its current campaign is being performed.

- Start-up Mode. ~~To be in start-up mode, the~~ The facility is operating in a transient state from shutdown or near shutdown to reach conditions in which the mission or campaign is performed. This mode is only prescribed for facilities where the procedures are complex and important to nuclear safety.

- Shutdown Mode. ~~To be in shutdown mode, the~~The facility is not performing its mission or its current campaign, and is incapable of doing so in its present condition. (This is to be understood to refer to a process state and not a facility shutdown.)

- Warm Standby. ~~To be in warm standby, the~~The facility is not operating but ~~still~~ retains its inventory of hazardous material.

- Repair Mode. ~~To be in repair mode, the~~The facility is not able to perform its mission in its current condition.

Submodes may be created and defined as needed for nonreactor nuclear facility TSRs. The definitions should be clearly written with numerical or other definite demarcation between submodes. The number of submodes should be limited as much as possible to avoid complexity and potential confusion.

~~8.~~4. Frequency Notation. The frequency notations, as used in the surveillances and elsewhere, should be defined as follows when included in the TSR, for example.

	Notation	Minimum Frequency (periodicity notation)
S	~~Shiftly (i.e., each~~Every shift~~)~~	At least once every 12 hours
D	Daily	At least once every 24 hours
W	Weekly	At least once every 7 days
M	Monthly	At least once every 31 days
Q	Quarterly	At least once every 92 days
S/A	Semiannually	At least once every 184 days
A	Annually	At least once every 365 days
C	Campaign	Before start-up of each campaign
R	Refueling	Before entering standby or operation modes after reactor refueling
S/U	Start-up	Before each start-up
N/A	Not applicable	Not applicable

2.2 Section 2—Safety Limits

SLs should describe as precisely as possible the process variables or the parameters being limited, and state the limit in measurable units ~~(pressure, temperature, flow, etc.).~~such as degrees, gallons per minute, or psi. (See Figures ~~8a~~4a and ~~8b~~4b for examples of SLs.) In general, SLs should be monitored continuously.

SLs should be based on. and specified in terms of these three ~~basic~~ rules~~.~~:

~~9.~~ **Rule 1:** Exceeding an SL is a TSR violation for each applicable mode. Upon exceeding an SL, the following steps should be taken:

~~•~~1. ~~the~~The affected parameter ~~must~~should be immediately brought within the SL~~;~~.

~~•~~2. ~~place the~~The facility should be placed in the most stable, safe condition attainable, including shutdown if appropriate~~;~~.

~~•~~3. ~~reactors are required to~~ Reactors should be shut down immediately - (e.g~~., scram);~~ . scrammed).

~~•~~4. ~~at nonreactor~~Nonreactor nuclear facilities~~, the TSR~~ should ~~specify actions to~~ be ~~taken that place the involved process~~placed in the most stable, safe condition attainable, including shutdown if appropriate~~; and~~ . The TSR should specify actions to be taken.

~~•~~5. ~~all~~All other ~~ACTION~~action requirements should be met.

~~10.~~ **Rule 2:** Each SL should have a mode applicability statement. This statement ~~should~~

~~consist of a simple list of~~identifies the modes or other conditions for which the SL is applicable.

~~ACTION~~**Rule 3:** Action statements should describe the actions to be taken in the event that the SL is not met. ~~These~~

In regard to Rule 3, specified actions should~~first~~:

- place the facility in a safe, stable condition ~~or should~~and verify that ~~the facility already is safe and stable and will remain so. Secondly, an ACTION statement should~~ this condition has been achieved;
- establish the steps and time limits to correct the out-of-specification condition~~. The actions should~~; and
- bring the affected parameter immediately within the SL and should ~~effect~~affect a shutdown of the facility, within a justified facility-specific time frame, normally less than an hour.

~~11.~~ Other actions required after exceeding an SL, including reporting ~~requirements~~the event and ~~an evaluation of~~evaluating possible damage~~caused by exceeding the SL~~, may be included in the ~~ACTION~~action statement or may be placed in Section 5, "Administrative Controls," with ~~proper~~ a suitable cross-reference~~to the requirement~~. A statement prohibiting restart~~, before~~ of operations until DOE approval~~, of the facility after an SL violation~~ is received should be included in the ~~ACTION~~action statement of each SL~~,~~ and in Section 5 of the TSR~~, or in both~~.

~~1.1.1.19~~ 2.3 Section 3/4—Limiting Control Settings, Limiting Conditions for Operation, and Surveillance Requirements[1]

This section contains LCSs~~and~~, LCOs~~.~~, and SRs. Mode and location applicability statements~~,~~ ~~ACTION~~ and action statements~~, and SRs~~ should also be included for each LCO or LCS, as appropriate~~. The most conservative value for each parameter or process variable contained in the safety analyses makes up the envelope within which the facility must operate to ensure that the DSA analyses bound safe operation~~.

~~12.~~ Limiting Control Settings. ~~-~~LCSs should describe, as precisely as possible~~,~~ (a) the parameter or process variable being controlled or equipment being actuated and ~~its limit, or~~(b) the limiting ~~setting~~settings of ~~the device to~~ control ~~it~~devices. This information may be presented in tabular or graphic form, with ~~whatever~~necessary written information~~that is necessary~~ placed in the body of the requirement. The LCS or an associated LCO should specify the allowed out-of-service time permitted when testing, resetting, repairing, or maintaining trip devices, and similarly specify the allowed outage time for associated equipment that must be removed from service for these activities.

[1] Section 3 delineates LCS and LCO operational limits. Section 4 describes SRs. There is usually a one-to-one correlation between LCS and LCO operational limits and the surveillances related to them. The combined TSR section is designated Section 3/4.

LCSs should be based on ~~and specified in terms of~~these three ~~basic~~ rules~~.~~ :

- **Rule 1:** Compliance with an LCS is required in the modes specified.

- **Rule 2:** Upon discovery that the instrumentation or interlock set point is less conservative than the required LCSs, the associated ~~ACTION~~action should require that it be reset. Other ~~actions~~requirements such as allowable outage times should be specified~~ (e.g., the time allowed out of service for resetting, test, maintenance, repair, or calibration).~~.

- **Rule 3:** If an automatic safety system is not ~~OPERABLE~~operable as specified, the action statement should describe the appropriate action ~~should be described in the ACTION statement~~ to ~~compensate. In~~restore the ~~case of reactors, that action may take~~affected system to an operable condition as well as compensatory measures while the ~~form of reactor shutdown and/or engineered~~automatic safety ~~feature initiation or adjustment. In~~system is out of service. The LCS should specify the ~~case of nonreactor nuclear facilities, such action might be manual process shutdown or process adjustment.~~ allowed out-of-service time permitted when testing, resetting, repairing, or maintaining trip devices and similarly the time permitted for associated equipment to be removed from service for these activities.

~~Figures 9a and 9b provide~~Figure 5 provides an example ~~LCSs~~of a LCS.

~~13.~~ Limiting Conditions for Operation. ~~-~~The LCO statement should describe, as precisely as possible, the lowest functional capability or performance level of equipment required for safe operation of the facility. Each separate limiting condition should have an LCO with associated mode applicability, ~~ACTION~~action statements, and SRs.

This part should contain the requirements for how LCOs should be applied. LCOs should be based on and specified according to three ~~basic~~ rules.

- **Rule 1:** Compliance with an LCO is required in the modes specified.

- **Rule 2:** The LCO should include an AOT to attempt restoration of ~~the required functional performance (~~operability~~)~~..

- **Rule 3:** Upon failure to meet an LCO, the associated ~~ACTION~~action requirement ~~should~~must be met.

In addition to these rules, the following guidance should be considered.

~~14.~~ Applicability~~. Mode and location applicability statements should be included for~~ Statements. For each LCS and LCO~~. These statements~~, the applicability statement should ~~consist of a simple listing of~~list the modes or conditions for which the LCS or LCO is applicable.

~~15. Actions. ACTION statements~~Action Statements. An action statement should describe the actions to be taken in the event that an LCS is exceeded or an LCO statement is not met. ~~ACTION~~Action statements should include the AOT to attempt to restore operability.

~~ACTION~~ Whenever possible, action statements should be ~~broken down whenever possible~~divided into separate ~~statements~~sections, each describing a single deviated condition requiring operator action~~; this~~. This format simplifies the explanation of the expected action and better ensures that the action will be performed correctly. Completion times for each action should be stated in simple units of time~~. Use the term "inoperable" to describe the deviated condition to avoid lengthy ACTION statements~~ such as minutes or hours.

Use the term "OPERABLE" to describe the corrected condition or part of the system without deviation. (While "inoperable" is presented in lowercase letters, ~~OPERABLE~~operable is presented in uppercase letters.) Keep wording in ~~ACTION~~action statements as brief as possible. Be consistent in the use of verbs and tense. Use the same wording structure when specifying requirements. Do not use articles unless necessary for clarity. When a mode change is required by an ~~ACTION~~action statement, it is preferable to use the actual title of the modes (i.e., rather than numerical designation of modes) to avoid a misunderstanding or a typographical error that could cause the operator to take inappropriate action. ~~ACTION~~Action statements should cover all reasonably expected combinations of ~~OPERABLE~~operable and inoperable components in the systems described. Generic LCOs can cover the conditions not called out in individual ~~ACTION~~action statements.

~~16.~~ Surveillance Requirements. SR statements ~~consist of short~~are descriptions of the type of surveillance required and its frequency of performance. These ~~statements should be as brief as possible but~~ should identify those requirements needed to ensure compliance with the LCS or LCO.~~ Begin each SR with a verb. Be consistent in use of terms and sentence structure among requirements.~~

~~Describe the purpose of SRs; that is,~~ SRs are requirements relating to test, calibration, or inspection that ensure the necessary operability and ~~quality~~availability of safety-related ~~systems and components required for~~SSCs. Surveillance should be based on the ~~safe operation of a facility~~following three rules.

~~Surveillance should be based on the following rules.~~

- **Rule 1:** SRs must be met for all ~~equipment, components, and conditions~~safety-related SSCs for the facility to be considered ~~OPERABLE~~operable.

- **Rule 2:** Each SR should be performed at the specified frequency, with a maximum extension of 25 percent of the interval between any two consecutive surveillances. (This extension is intended to provide operational flexibility both for scheduling and for performing surveillances. It should not be relied upon as a routine extension of the specified interval.)

- **Rule 3:** Special test exceptions to TSRs may be allowed under controlled conditions. These test exceptions should be placed in Section 3 (LCO). Any test exception should ~~be clearly written to state~~explain which LCOs are ~~being excepted~~affected, for how long, and ~~under~~ what ~~conditions~~compensatory measures (such as enhanced supervision) will be taken.

~~1.1.1.20~~ 2.3.1 Section 5—Administrative Controls

This section ~~should impose~~imposes administrative requirements necessary to ~~control operation of the facility such that it meets the~~ensure TSR compliance. The paragraphs that follow discuss some of the ACs that should be placed in this section. ~~Where information is provided by reference, the specific ACs relied upon in the safety analyses should be identified and summarized.~~

~~17.~~ Contractor Responsibility. The facility or plant manager is responsible for overall operation of the nuclear facility and should delegate in writing the succession to this responsibility during his or her absence. The shift supervisor is responsible for the local command function. During any absence of the shift supervisor from the area, a designated, qualified individual should be assigned the command function.

~~18.~~ Contractor Organization. On-site and off-site organizations should be described for facility operation and contractor management. The on-site and off-site organizations should be described in terms of the lines of authority, responsibility, and communication for the highest management levels through intermediate levels to and including all operating organization positions. The individuals who train the operating staff and those who carry out health physics and quality assurance functions may report to the appropriate on-site manager; however, they should have sufficient organizational freedom to ensure their independence from operating pressures.

~~19.~~ Procedures. Operations procedures should provide sufficient direction to ensure that the facility is operated within its ~~design basis and supports safe operation of the facility. This should include emergency operating procedures; operating procedures for all phases of operation, maintenance, procedures for all surveillances required by TSR; Security Plan implementation; Emergency Plan implementation; fire protection; procedures for all programs listed in paragraph (4) below; and procedures governing the administrative aspects of operation of the facility.~~approved design basis. Topics that should be considered for coverage include:

- Operating procedures for all modes of operations,
- Emergency Operating Procedures,
- Maintenance Requirements,
- Required surveillances,
- Emergency plans,
- Fire protection,
- Safety Management Program Implementation procedures; and
- Administration.

A system should be developed to control all procedures ~~that provide assurance of safe operation. Procedures that are important~~related to ~~safety need to be identified for special attention to ensure that such procedures are given proper attention in proportion to the hazard that they control and that they are performed reliably (see the discussion in Section 4.10.7).~~TSR compliance. The system should include ~~the mechanism~~mechanisms for review, approval, revision, control, and temporary changes to the procedures. The ~~TSR should include appropriate identification and summary of or reference to the procedures~~TSRs refer to the control system adopted.

Programs. ~~-~~Programs developed to ensure the safe operation of the facility should be discussed ~~here~~ and ~~thereby~~ committed to by reference. ~~These~~Such programs should include ~~as appropriate but not be limited to~~(1) in-service inspection of components, pumps, and valves as per ASME Boiler and Pressure Vessel Code Section XI~~;~~,
(2) worker protection (such as radiation protection ~~programs; in-plant radiation,~~), (3) process control ~~programs;~~, (4) ventilation filter testing ~~program;~~, (5) explosive gas and storage tank radioactivity monitoring ~~programs;~~, (6) radiological effluent control~~;~~, (7) quality ~~programs;~~assurance, (8) criticality safety, (9) configuration control ~~programs;~~, and (10) document control.

~~20.~~ The basic elements of these programs should be described in this section, but the details and implementing processes for each program should be placed in separate controlled volumes and are not to be included in the TSR. ~~The detailed Nuclear Criticality Safety Program may be presented in this subsection of the TSR.~~

~~21.~~ Minimum Operations Shift Complement. ~~-~~This section of the ACs should ~~include~~state the maximum daily working hours and maximum number of consecutive days on duty.

The required total staffing of operating shifts for nonreactor nuclear facilities, and the members of the shift staff required to be present in the control room or control area for different operating conditions, should be specified ~~in the AC section~~based on the ~~basis of relevant~~ safety ~~analyses~~analysis.

~~22.~~ Operating Support. ~~-~~A list of facility support personnel by name, title, and work and home telephone number must be kept up to date. The list should include management, radiation safety, and technical support personnel. The list ~~itself should not be in the TSR, but~~ should be referenced in the TSR and ~~is required to be~~made readily accessible~~.~~ to operating personnel.

~~23.~~ Facility Staff Qualifications and Training.~~-~~ Minimum qualifications for members of the facility staff in positions affecting safety should conform to the requirements of DOE ~~5480.20A~~Order 426.2 or successor ~~documents and~~document. These requirements should be ~~provided~~referenced in the AC section.

~~24.~~ ~~Record Keeping.~~ Recordkeeping. Records need to be kept of all information supporting the implementation of the TSR~~, including operational logs of modes changes, entering actions, surveillances, deviations, procedures, programs, meetings, recommendations, etc~~. To this end, a records retention program should be established that determines which records are to be kept, in what format, for how long, and under what storage requirements.

~~25.~~ Reviews and Audits. ~~Describe~~This section describes the methods ~~established~~used to conduct independent reviews and audits. ~~The methods may take a range of forms acceptable to DOE. These~~Methods may include creating an organizational unit, a standing or ad hoc committee, or ~~assigning~~assigned individuals capable of conducting these reviews and audits. Individual reviewers should not review their own work or work for which they have direct responsibility. ~~When an individual performs a review function, a cross-disciplinary review determination is necessary. If deemed necessary, such reviews will be performed by the review personnel of the appropriate discipline.~~ Individual reviewers should not review their own work or work for which they have direct responsibility. ~~-~~Regardless of the method used, management should specify the functions, organizational arrangement, responsibilities, appropriate ~~ANSI/ANS 3.1-1981~~ qualifications, and reporting requirements of each functional element or unit that contributes to these processes.

Reviews and audits of activities affecting facility safety have two distinct elements. The first of these is the review performed by facility personnel to ensure that day-to-day activities are conducted in a safe manner consistent with the TSRs. The second is the review and audit of activities and programs affecting nuclear safety performed independently of the facility staff.

~~The second of these is the review and audit of facility activities and programs affecting nuclear safety that is performed independently of the facility staff. The independent review and audit should provide for the integration of the reviews and audits into a cohesive program to provide senior level facility operation and recommend actions to improve nuclear safety and facility reliability. It should include an assessment of the effectiveness of reviews conducted by facility staff.~~

Facility staff reviews should include: TSR changes, USQ determinations~~;~~, proposed tests and experiments~~;~~, procedures~~;~~, programs~~;~~, facility changes and modifications~~; TSR changes;~~, facility operation, maintenance, and testing; DOE and industry issues of safety significance; and any other safety-related items.

Reviews by the ~~off-site~~independent safety organization should include~~: USQ determinations; proposed changes to the TSR;~~ these same items and in addition: conformance with TSRs, violations of codes, orders, and procedures that have safety and health significance~~;~~, Occurrence Reports~~;~~, staff training, qualifications and performance~~;~~, quality assurance program adherence, unanticipated deficiencies of SSCs that could affect nuclear safety~~;~~, significant, unplanned radiological or toxic material releases~~;~~, and significant operating abnormalities.

~~Audits by the off-site safety organization should include conformance with TSR; training and qualification of facility staff; program implementation; deficiency corrective actions; quality program adherence; and other activities of safety significance.~~

~~Appendix D to this Guide provides~~ (For additional guidance on ~~performance of~~performing independent Implementation Verification Reviews ~~(IVR) of Safety Basis Controls.~~of TSRs, see Appendix C.)

~~26. Deviations from Technical Safety Requirements. State the actions and reporting to be taken for deviations from TSRs.~~

TSR Violations. This section defines what constitutes a TSR violation and associated reporting requirements. See Figure 10 in appendix B for an example.

~~1.1.1.21~~ 2.3.2 Section 6—Design Features

~~A design features section should be included with the TSR.~~ The purpose of ~~the~~a design features section is to describe in detail ~~those~~ features not covered elsewhere in the TSRs that, if altered or

~~modified~~degraded, would have a significant effect on safety. The following two areas should be addressed in this section~~.~~

~~27.~~ ~~Vital~~: (1) Significant passive safety SSCs such as piping, vessels, supports, structures (such as confinement), and containers, and (2) configuration or physical arrangement of SSCs. For each design feature covered, the discussion should address the specific parameters being controlled and the technical basis for the importance of these parameters. One example might be the need to maintain the configuration and physical separation of stored materials to avert a criticality event.

~~28. Configuration or physical arrangement including dimensions, the parameter(s) being controlled, and the reasoning behind the design should be provided as identified in the safety analysis. Examples of such situations are where criticality avoidance is dependent on physical separation and where equipment configuration is used to minimize radiation levels.~~

(Note: Surveillance requirements for DFs are typically located in programs such as configuration management or in-service inspections (ISIs). In many cases it is appropriate to include or reference ISIs for design features in section 6 of the TSR.)

~~1.1.1.22~~ 2.3.3 Bases Appendix

This appendix provides ~~summary statements of the reasons for the~~ technical reasoning behind the SLs, LCSs, LCOs, and ~~associated~~ SRs. The bases show how the numeric values, ~~the~~ conditions, ~~the~~ surveillances, and ~~the ACTION~~action statements fulfill the purpose derived from the safety documentation. The primary purposes for describing the bases of each requirement are to (a) ensure that future changes to the requirement will not adversely affect its original intent or purpose ~~by invalidating the safety analysis and to~~, and (b) aid in understanding why the requirement exists. The bases appendix should reference relevant sections of the ~~more specific detailed~~ safety analyses ~~related to the TSR and the derivation of TSR section of the DSA for other related analyses discussed in the DSA.~~ .

2.4 Format

~~It is extremely important that the~~The TSR document must be ~~both~~ usable by the operations staff and at the same time understandable by ~~the Department~~DOE and ~~any~~ contractor ~~organizations~~managers charged with review responsibilities. To meet both of these ~~ends~~objectives, a suggested format is provided ~~in detail~~ in the following sections. This standardized format should minimize the burden on oversight organizations and make any necessary training of operations staff easier.

DOE recognizes, however, that wholesale changes in TSR documentation for the sake of consistency may be ~~counterproductive to~~costly and produce no balancing safety benefit. Thus, DOE will approve TSRs in other formats if the contractor provides adequate justification and the requirements of ~~the TSR and DSA rules~~10 C.F.R. Part 830 are met. In particular, the ~~new~~ three-column format ~~recommended by the NRC TSIP~~ provides an advantage in terms of clarity for the operator and is strongly suggested (but not required) for those facilities with complex operations and many safety or operational limits. ~~Additionally, for those facilities with DOE-approved TSs or OSRs, operation with existing documentation is permissible as provided in the TSR rule.~~

~~1.1.1.23~~ 2.4.1 Numbering of Pages, Sections, Tables, and Figures

~~29.~~ Page Numbering. All page numbers should be centered at the bottom of the page. The following paragraphs describe the page numbering schemes for individual sections of the TSR.

- Front Matter Pages. Number the front matter pages with successive lowercase Roman numerals (i, ii, iii, etc.).
- Section Pages (except Sections 2 and 3/4). All section page numbers, except for Sections 2 and 3/4, should have two parts: an Arabic number for the section, followed by a dash, and an Arabic number designating the numerical page number within the section. For example, pages in Section 1 would be numbered 1-1, 1-2, 1-3, etc.; likewise, pages in Section 5 would be numbered 5-1, 5-2, 5-3, etc.
- Sections 2 and 3/4 Pages. Sections 2 and 3/4 are subdivided into numerous subsections corresponding to the individual requirement numbers. The first part of each page number for Sections 2 or 3/4 should, therefore, correspond to the subsection number. This subsection number should be followed by a dash and an Arabic number designating the numerical page number within the subsection (e.g., 2.1.1-1, 3/4.1-1~~, 3/4.1-2, 3/4.2-1, 3/4.2-2, 3/4.2-3; see also the examples in the figures that follow Section 5 of this Guide).~~).
- Appendix Pages. Number all pages of appendices, except for the bases appendix, with an alphanumeric number consisting of the appendix letter and the sequential page number separated by a dash.
- Bases Appendix Pages. All page numbers for the bases appendix should begin with the word "Bases" followed by the section number for the particular section the basis supports (see examples below).
  - —Bases 2.1-1, Bases 2.1-2, . . .
  - —Bases 3/4.0-1, Bases 3/4.0-2, . . .
  - —Bases 3/4.1-1, Bases 3/4.1-2, . . .

~~30.~~ Paragraph Numbering for Sections 1, 5, and 6. Paragraphs should be numbered hierarchically with successive Arabic numerals separated by decimal points. The following scheme should be used for subordination of paragraphs.

- 1.1 Major Paragraph
- 1.1.1 First Subordinate Paragraph
- 1.1.1.1 First Subdivision of First Subordinate Paragraph

- 1.2 Second Major Paragraph

~~31.~~ Numbering for Sections 2 and 3 (Safety Limits, Limiting Control Settings, and Limiting Conditions for Operation). ~~-~~All SLs, LCSs, and LCOs should begin with either 2 or 3, then the number associated with the group, which will be followed by the number of the requirement, per the following examples. (Complex systems may require further subdivision.)

- 2.11 Reactor Coolant Circulation System
- 3.10.2.1 Diesel Generator Fuel Oil Tank

  - ~~a.~~ Number SLs beginning with 2.1 and continuing with 2.2, 2.3, etc. Any subdivision of SLs should be numbered with an additional number added to the number of the SL; for example, 2.1.1, 2.1.2, etc.

  - ~~b.~~ Number OLs beginning with 3.1 and continuing with 3.2, 3.3, etc. Any subdivisions of OLs should be numbered with an additional number added to the number of the LCS (e.g., 3.2.2, 3.2.3, 3.2.4). OLs should be grouped by principal system or function and each OL within a group should be numbered sequentially. LCSs are normally the first requirements within a group. For reactors, normally all OLs can be put into the following groups~~.~~:

    ~~0. Limiting Condition for Operability~~

    - ~~1.~~ Reactivity Control
    - ~~2.~~ Core Power Distribution
    - ~~3.~~ Instrumentation
    - ~~4.~~ Coolant System
    - ~~5.~~ Safety Systems
    - ~~6.~~ Confinement/Containment
    - ~~7.~~ Plant Systems
    - ~~8.~~ Electrical Systems
    - ~~9.~~ Experiment Facilities
    - ~~10.~~ Rad Waste Systems
    - ~~11.~~ Special Tests
    - ~~12.~~ Refueling Requirements
    - ~~13.~~ Spent Fuel Pool Requirements

For less complex reactor facilities, omit any inappropriate groups above~~ (except 0)~~, but retain the same numbering scheme to indicate that a group was omitted. Add other groups as necessary.

For nonreactor nuclear facilities, standardized grouping of requirements is more difficult because of the diversity of facilities; however, many facilities will have the following.

~~0. Limiting Condition for Operability~~

- ~~1.~~ Criticality, Radioactivity, and Hazardous Material Alarm Systems
- ~~2.~~ Confinement/Ventilation
- ~~3.~~ Fire Detection and Suppression

~~4.~~• Emergency Power
~~5.~~• Chemical Systems
~~6.~~• Instrumentation
~~7.~~• Experimental Facilities

- For less complex nonreactor facilities, omit any inappropriate groups above, but retain the same numbering scheme to indicate that a group was omitted. Add other groups as necessary.

- ~~c.~~ ~~ACTION~~Action statements should be lettered with uppercase letters. Subdivisions of ~~ACTION~~action statements should be numbered 1, 2, 3, etc.~~ (See Figure 10a for an example of numbering of LCO and ACTION statements.)~~

~~32.~~ Numbering for Section 4 (Surveillance Requirements).~~-~~ SRs should be designated with numbers beginning with 4. The second number should correspond to the grouping scheme used for the LCS or the LCO, and the third number in the sequence indicates the LCS or the LCO that this surveillance principally supports. Hence, the SRs will have numbers the same as the LCS or the LCO that they support except for the first number, which will be a "4" instead of a "3." Subdivisions should be identified with a lowercase letter and indented; further subdivisions should be labeled consecutively with a number enclosed in parentheses [e.g., (1), (2~~), etc.]~~)] and should be indented from the letter.

~~33.~~ Numbering Bases (Bases Appendix). ~~-~~Bases are numbered in accordance with the number of the SL, LCS, or LCO that they support.

~~34.~~ Numbering Tables.~~-~~ All tables should be located as close as possible after the place where they are first referenced. Where tables and figures are both referenced in a specification, present the tables before the figures. Table numbers in Sections 2 and 3/4 should begin with the number of the specification to which they apply, followed by a dash, and then sequential Arabic numerals.

Example Table Numbers for Section 3/4

Table 3.3.1-1. -Title

Table 4.2.5-1. -Title

Numbers of tables in the bases appendices should begin with the words "Bases Table" and the subsection number that they support, followed by a dash and then sequential Arabic numbers.

Example Table Numbers for Bases Appendix

Bases Table 3/4.1-1. -Title

Bases Table 3/4.2-1. -Title

Table numbers in all other sections should begin with the applicable section number followed by a dash and then sequential Arabic numbers.

Example Table Numbers for Sections Other Than Bases and Sections 2 and 3/4

Table 5-1. -Title, (Sheet 1 of 6)

Table 5-2. -Title

For multiple-page tables in all sections, use the phrase (Sheet 1 of __, Sheet 2 of __, etc.) after the table title (see example above).

~~35.~~ Numbering Figures.- All figures should be located as near as possible after the place where they are first referenced. Figure numbers in Sections 2 and 3/4 should begin with the number of the requirement to which they apply, followed by a dash, then sequential Arabic numbers.

Example Figure Numbers for Section 3/4

Figure 2.1.1-1. -Title

Figure 3/4.2.1-1. -Title

Figure 3/4.2.5-1. -Title

Figure numbers in the bases appendixes should begin with the words "Bases Figure" and the subsection number that they support, followed by a dash and then sequential Arabic numbers.

Example Figure Numbers for Bases Appendix

Bases Figure 2.1-1. -Title.

Bases Figure 3/4.2-1. -Title.

Figure numbers in all other sections should begin with the applicable section number followed by a dash and then sequential Arabic numbers. For multiple-page figures in all sections, use the phrase (Sheet 1 of __, Sheet 2 of __, etc.) after the figure title.

Example Figure Numbers for Sections Other Than Sections 2 and 3/4 and Appendix

Figure 5-1. -Title, (Sheet 1 of 6).

Figure 5-2. -Title.

~~1.1.1.24~~ 2.4.2 Page Headings

Use uppercase letters in the page headings for consistency and to set the headings apart from the body text. Separate the heading information from the body of the requirement by a solid horizontal line across the entire page ~~(see Figures 9a and 9b).~~

~~1.1.1.25 Continuation Pages~~

~~Use the word "continued" in parentheses and in lowercase letters to denote continuation of a grouping of ACTION statements, surveillances, or bases to the next page (see Figures 13 and 15).~~

~~Example Page Headings~~.

Example 1.

3/4.4 REACTOR COOLANT SYSTEM

3.4.2 PRESSURE PROTECTION SET POINTS

Example 2.

3/4.6 CONFINEMENT SYSTEMS

3.6.2 AIR CLEANING SYSTEM

2.4.3 Continuation Pages

Use the word "continued" in parentheses and in lowercase letters to denote continuation of a grouping of action statements, surveillances, or bases to the next page.

Example 3.

3/4.6 CONFINEMENT SYSTEMS

4.6.1 SURVEILLANCE REQUIREMENTS (continued)

~~1.1.1.26~~ 2.4.4 Highlighting

Various forms of highlighting may be used to improve visibility of the information presented. These include the following.

~~36.~~ Bolding.~~-~~ Bold type may be used to highlight the major headings, table column headings, and to emphasize especially important information. Notes can also be in bold type for added emphasis.

~~37.~~ Spatial Dedication.~~-~~ The SL, LCS, and LCO requirements may be offset or indented so that this information stands out from the surrounding text. Recognition and separation of the SL, LCS, and LCO requirements allows this information to be more quickly and easily located and scanned without interference from the surrounding text. Also, the SL, LCS, and

LCO mode applicability headings may be separated by extra "white space" (blank lines), allowing for quick recognition and scanning of specific information.

~~38.~~ Delimiters.- Delimiters function as visual cues for the user, signaling the beginning and/or end of specific segments of information (two independent requirements on the same page, for example). Delimiters may take the form of two closely spaced horizontal lines, one dark, heavy line, a series of dark dashes, or any similar prominent marking.

~~39.~~ Underscoring.- Underscoring is an effective way of adding emphasis to specific information, when properly used; however, it tends to lose its effectiveness when used too much. For this reason, underscoring should be used only to add emphasis to logical connectors (AND, OR, etc.).

~~1.1.1.27~~ 2.4.5 Use of Logic Terms (AND, OR, IF, BUT, etc.)

~~Logic terms should be used as little as possible. In preparing TSRs, try to avoid logic terms. When they must be used, the~~The following guidelines apply.

- All logic terms should be underscored, in uppercase bold type, and flush left between the two (or more) sets of connected conditions to which they apply.
- AND should be used to connect two or more sets of criteria that must both (all) be satisfied for a given logical decision. If more than two sets of conditions are required, a list format is preferable.
- OR should be used to denote alternative combinations or conditions, meaning either one or the other. ~~Because it can be misinterpreted, the use of **OR** should be avoided whenever possible.~~

When action steps are contingent upon certain conditions, terms such as IF, BUT, IF NOT, ~~etc.,~~ may be used as appropriate~~; however, use of such terms should be kept to a minimum. Where possible, rewrite the condition so the logic term is not needed.~~ .

~~1.1.1.28~~ 2.4.6 Notes and Cautions

Notes and cautions should not normally occur within the context of the TSR.- The TSR in itself is a compendium of potential cautions, and notes often indicate that the basic explanation is inadequate. When notes or cautions are necessary, the following apply.

- Cautions should precede the information to which they refer, with no other intervening information. Notes may be placed before or after the text they amplify, whichever is most appropriate. All notes and cautions should be preceded by the centered heading "**NOTE**" or "**CAUTION**" in uppercase, bold type. Text in the note or caution statement should be in bold type, indented from both sides of the page. Cautions should be delimited from standard text.

- Notes and cautions pertaining to information inside the action and SR statements should be placed before the information to which they apply, with no other intervening information.

~~1.1.1.29~~ 2.4.7 Tables

When the volume of tabular information to be presented is small, consider integrating the information in text rather than using a separate table. When tables are necessary, they should be located as conveniently as possible for the user. They should have a formal title and number.

~~1.1.1.30~~ 2.4.8 Body of Section 1—Use and Application

This section is expected to be mostly text, so it should take the form of paragraphs numbered in accordance with Section ~~5.3~~2.4.1. Other forms of input should follow the guidance outlined in Section ~~5.3.~~ 2.4.

~~1.1.1.31~~ 2.4.9 Body of Section 2—Safety Limits

SLs should be presented in ~~the~~a single-column ~~format shown in Figures 8a and 8b~~ or ~~the~~ three-column format ~~shown in Figure 8c.~~ .

The page heading, as described in Section ~~5.3~~2.4.2, should be to the left margin of the page. The SL, denoted by the acronym SL, should follow, separated by at least one blank line from other text ~~(see examples in the figures that follow this section).~~. If the requirement has subdivisions, they should follow on separate lines and be indented.

Below the requirement, with sufficient space left above to make the requirement stand apart, the word "**APPLICABILITY**" should appear at the left margin, in bold uppercase letters, followed by a colon (also bold). On the same line should be the applicability modes or other conditions.

Below the applicability statement, separated by at least one blank line, the word "**ACTIONS**," in bold, uppercase letters, followed by a bold colon, should appear. The ~~ACTION~~action statements should follow, indented from the left margin and labeled with capital letters. Subdivisions of the ~~ACTION~~action statements should be further indented and numbered.

~~1.1.1.32~~ 2.4.10 Body of Section 3/4—Limiting Control Settings, Limiting Conditions for Operation, and Surveillance Requirements

Figures ~~9a–9b, 10a–10b, and 11a–11c are~~7 through 10 provide examples of the way information for Section 3/4 should be presented. The page headings should be as described in Section ~~5.3~~2.4.2 and should be to the left-hand margin of the page. Below the heading and indented should be the letters "LCS" or "LCO" in bold uppercase letters. This should be followed on the same line by a colon and then the requirement. For simple requirements a sentence or two may suffice, while for a complex requirement subdivisions may be necessary. Use uppercase letters for the main divisions and indented numbers as the first subcategory. Use indented lowercase letters for the next division, if necessary. If further division appears to be necessary, consider making an entire new requirement within the main group.

Below the requirement, separated by at least one blank line, the word "**APPLICABILITY**" should appear at the left margin, in bold, uppercase letters. On the same line should be the applicability modes or other conditions.

Below the applicability statement, again, separated by at least one blank line, should appear the word "**ACTIONS**" in bold, uppercase letters. The ~~ACTION~~action statements should follow. The main divisions and subdivisions of the ~~ACTION~~action statements should be numbered/lettered according to conventional outlining practices or as described above for requirements.

SRs should follow the ~~ACTION~~action statements, separated by at least one blank line. They should be labeled by the title (~~surveillance requirements~~**SURVEILLANCE REQUIRMENTS**) in bold, uppercase letters. The surveillance statement should include the surveillance number; a statement of the requirement (with indented subdivisions, if necessary); and an indication of the frequency. Examples of the suggested format for SRs are given in ~~Figures 11b, 11c and 13.~~Appendix B. Additional examples of the three-column format have been developed by DOE for specific types of SSCs and are available in the Defense Programs TSR Document of Examples, Technical Safety Requirements, November 1993.

2.4.11 Body of Sections 5 and 6—Administrative Controls and Design Features

These sections are expected to be mostly text, possibly with tables, so they should take the form of paragraphs numbered in accordance with Section ~~5.3~~2.4.1 of this Guide.

2.4.12 Body of Bases Appendix

The body of the bases appendix should be presented in the format shown in ~~Figure 21.~~Figures 217b or 9b. The page heading should be that described in Section ~~5.3~~2.4.2, with the number of the SL, LCS, or LCO and the same title used in that requirement. Below the requirement number and title ~~(B3/4.4 PRESSURE LIMITS in Figure 21, for example),~~, the word **BASES** in bold, uppercase letters should be at the left margin, followed by a delimiter and the bases themselves.

2.5 Changes to Technical Safety Requirements

Changes to the TSR should be designated in the following manner:

- a list of pages in effect with page number and date~~,~~;
- a record of revision pages~~,~~;
- sidebar changes in the TSR text~~,~~; and,
- for each altered page ~~should contain~~ , the page number, document number, and ~~the~~ revision number.

Appendix B: TSR Examples

Contents

Introduction

This appendix provides examples of TSR controls similar to those that might be found in a DOE nuclear facility. The appendix may be used as a reference, but does not contain requirements. The examples offered do not represent an existing DOE facility, although some may have been adapted from existing facilities.

The appendix follows the order of a typical TSR, with the exception of the TSR Bases section. Thus the appendix begins with a Use and Application section and ends with a Design Features section. The technical bases for each example appear immediately following the TSR itself. Explanatory sections are provided to aid users in understanding each example.

TABLE OF CONTENTS

Figure 1. Example Table of Contents for a Nuclear Reactor Facility TSR.

TABLE OF CONTENTS

Figure 2. Example Table of Contents for a Nonreactor Nuclear Facility TSR.

~~LIST OF TABLES~~

~~Figure 3. Example List of Tables for a Nuclear Reactor Facility TSR.~~

~~LIST OF TABLES~~

~~Figure 4. Example List of Tables for a Nonreactor Nuclear Facility TSR.~~

~~LIST OF FIGURES~~

~~Figure 5. Example List of Figures for a Nuclear Reactor Facility TSR.~~

~~LIST OF FIGURES~~

~~Figure 6. Example List of Figures for a Nonreactor Nuclear Facility TSR.~~

~~**DEFINITIONS**~~

~~**ACTION.** The steps listed in each requirement that are required to be performed when the specified LIMITING CONDITIONS FOR OPERATION are not met.~~

~~**ACTUATION LOGIC TEST.** The application of various simulated input signal combinations in conjunction with each possible interlock logic state and verifying the required logic output. Will include, as a minimum, a continuity check of output devices~~

~~**ANALOG CHANNEL OPERATIONAL TEST.** Injection of a simulated signal into . . .~~

~~***Note: Terms defined in this list appear in uppercase type throughout these Technical Safety Requirements.***~~

~~Figure 7. Example~~ **Table of Contents Example Discussion**

The "Use and Application" section appears first in a TSR document because it contains the conventions to be used throughout the TSRs. "Use and Application" explains to the user how to interpret the array of information that follows and how to use that information correctly.

Traditionally, the order of the sections in most TSR documents has followed the order originally established for nuclear reactors. In reactors, the sections are arranged in what was established as the order of importance for safe operations. The "Safety Limits" follows the general "Use and

Applicability" section because these limits are established reactor design parameters that relate directly to adequate protection of the public health and safety. Following in order of importance is the "Operating Limits and Surveillance Requirements" section which specifies the safe operating parameters for all the reactor's structures, systems, and components (SSCs). The "Administrative Control" section appears last.

For non-reactor facilities, position in the TSRs is not necessarily an indicator of the control's importance to safety. For example, the first limiting condition of operation (LCO) in many TSRs is the facility material-at-risk (MAR) limit, which protects the source term as analyzed in the documented safety analysis (DSA). This LCO is a SAC and differs from the reactor LCO in that it is not an SSC operating limit. However, whether this SAC appears in the "Operating Limits and Surveillance Requirements" section or the "Administrative Control" section of a TSR does not affect the importance to safety of this particular limit. For reactors, the TSRs are typically developed prior to construction and therefore the ability to prioritize engineering controls and follow established operational priority. DOE non-nuclear facilities consist of a much broader range of operations and phases of life cycles, which could make the traditional operational priority of sections impractical. For example, new construction under a preliminary documented safety analysis (PDSA) may have more dependence on engineering controls whereas an environmental restoration site may be required to be completely dependent on administrative controls. However, the principle of operational priority still applies within sections or individual controls themselves. When it is established that a particular control or limit is more important than another, it should precede the other limits within the section or control (LCO).

DEFINITIONS

ACTION - The part of the TSR that prescribes Required Actions to be taken under designated Condition within specified Completion Times.

CALIBRATION - The adjustment (as necessary) of the output such that it meets established acceptance criteria (e.g., responds within the necessary range and accuracy to known values). The CALIBRATION SHALL encompass the sensor, alarm, and trip functions, and SHALL be checked by a FUNCTIONAL TEST.

CHANNEL - The combination of sensor, line, amplifier, and output devices that are connected for the purpose of measuring the value of a parameter and providing a signal for actuation.

COMPLETION TIME - The amount of time allowed for completing an ACTION. See Section 1.3.

CONDITION - A discrete degradation of a system or component in which an ACTION is performed within a specified COMPLETION TIME.

ENSURE - To confirm, substantiate, and assure that an activity or CONDITION has been implemented in conformance with the specified requirements. Allows for manipulation of equipment or instrumentation to conform with specified requirements. May be done by reliable methods other than direct observation.

FUNCTIONAL TEST -Tests OPERABILITY, including required alarms, interlock(s), trip functions, and CHANNEL failure trips (e.g., the injection of a simulated or actual signal into the CHANNEL as close to the sensor as practical). In contrast to VERIFICATION, this FUNCTIONAL TEST is an active test of the system.

IMMEDIATE/ IMMEDIATELY - Term used as a COMPLETION TIME for ACTION statements when a step is to be initiated as soon as possibly achievable without creating a less safe condition, and continuously and aggressively pursued until complete.

SAFE CONFIGURATION - Condition resulting from the minimization of risk in on-going processes commensurate with the chemical and/or physical form of material and/or arrangement of material and/or equipment.

SHALL - Denotes a mandatory requirement that must be complied with to maintain the requirements, assumptions, or conditions of the facility SAFETY BASIS.

TERMINATE - Means to stop an operation or activity as quickly and safely as possible.

TIME OF DECLARATION - The actual time when the Facility Operations Director or designee determines that a CONDITION exists that requires entry into the ACTION statement of an LCO. As soon as possible upon notification of a problem, the problem should be evaluated and the Facility Operations Director or designee should make this declaration if it is determined that an LCO is not met.

Figure 3. Example Definitions List.

~~RCS~~
~~SL~~

2.1 SAFETY LIMITS

2.1.1 REACTOR COOLANT SYSTEM (RCS) PRESSURE SAFETY LIMIT

Definitions Example Discussion

Writers and reviewers of a TSR document must be aware of the potential for misinterpretation of a term and carefully consider which terms used in the document should be defined. Convention dictates that all terms defined in the TSR document, are shown in upper-case letter when their usage so dictates in the TSR. This use of upper-case letters indicates to the reader that these terms may have a specific meaning apart from general usage, and that the definition is available in the TSR itself.

These are examples of terms which should be considered for inclusion in the Definition section of the TSR. Definitions should be tailored to the specific facility and controls as derived from the DSA.

2.1 SAFETY LIMITS

2.1.1 REACTOR COOLANT SYSTEM (RCS) PRESSURE SAFETY LIMIT

SL: The RCS shall be maintained < 1000 psia

APPLICABILITY: Operation Mode

ACTIONS:
1. Go to SHUTDOWN mode IMMEDIATELY,
2. Notify the DOE CSO within one hour of reaching SHUTDOWN mode, and
3. Prohibit facility operation until authorized by DOE.

~~HFR TSR 2.1-5 Rev.0 9/13/01~~

Figure ~~8a~~4a. Example of Safety Limit for a Nuclear Reactor Facility.

2.1 SAFETY LIMITS

2.1.1 REACTOR COOLANT SYSTEM (RCS) PRESSURE SAFETY LIMIT

~~Heading Glovebox Temperatures~~
~~SL~~

~~2.1 SAFETY LIMITS~~

~~2.1.1 HEATING GLOVEBOX, HEATING TEMPERATURE SAFETY LIMIT~~

~~**SL:** The Safety Limit shall be the minimum auto-ignition temperature for the unstable material in the heating glovebox.~~

~~**MODE APPLICABILITY:** All modes when unstable material and plutonium are present in the heating glovebox.~~

~~**ACTIONS TO TAKE ON SL VIOLATION:**~~

1. ~~IMMEDIATELY evacuate the facility of all personnel.~~
2. ~~Power to the affected heating glovebox shall be IMMEDIATELY interrupted in a safe manner as determined by the Facility Manager or alternate. Remote shutdown of all power to the facility should be considered as an alternative to entering the facility to shutdown only the affected heating glovebox.~~
3. ~~Perform the Actions associated with Sections 5.3.2.1.~~

~~TSR 2.1-5 Rev. 0 9/13/01~~

~~**Figure 8b. Example of Safety Limit for a Nonreactor Nuclear Facility.**~~

~~RCS~~
~~SL~~

~~2.1 SAFETY LIMITS~~

~~2.1.1 REACTOR COOLANT SYSTEM (RCS) PRESSURE SAFETY LIMIT~~

SL: The RCS shall be maintained < 1000 psia

MODE APPLICABILITY: Operation Mode

ACTIONS:

CONDITIONS	REQUIRED ACTION	COMPLETION TIME
A. The RCS exceeds the Safety Limit (1000 psia).	A.1. Go to SHUTDOWN mode.	**IMMEDIATELY**
	AND	
	A.2. Notify the DOE CSO.	Within one hour of reaching SHUTDOWN mode
	AND	
	A.3. Prohibit facility operation.	Until authorized by DOE

~~HFR TSR 2.1-5 Rev. 0 9/13/01~~

Figure ~~8c~~4b. Example of Safety Limit for a Nuclear Reactor ~~Facility~~ in Three-Column Format.

~~Heading Glovebox~~
~~LCS~~

~~3/4.2 LIMITING CONTROL SETTINGS~~

~~3.2 HEATING GLOVEBOX, HEATING TEMPERATURE LIMITING CONTROL SETTING~~

~~LCS:~~ ~~The temperature setting of the Temperature Control Heating Shutoff shall be no greater than the Safety Limit (SL 2.1) minus 36° C.~~

~~MODE APPLICABILITY:~~ ~~Operational and Maintenance when unstable materials and Plutonium are present in the heating glovebox~~

~~ACTIONS:~~

~~CONDITIONS~~	~~REQUIRED ACTION~~	~~COMPLETION TIME~~
~~A. The temperature setting in the temperature control heating shutoff exceeds the Safety Limit (SL 2.1) minus 36° C.~~	~~A.1. Shutoff power to the heaters in the affected heating glovebox.~~	**~~IMMEDIATELY~~**
	~~AND~~	
	~~A.2. Evacuate the facility of all personnel, except for those directly involved with corrective actions.~~	**~~IMMEDIATELY~~**
	~~AND~~	
	~~A.3. Repair and functionally test the affected heating glovebox and equipment.~~	~~Before returning power to the heaters in the affected heating glovebox.~~

~~TSR 3/4.2-5 Rev. 0 9/13/01~~

~~Figure 9a. Example of Limiting Control Settings.~~

~~Coolant Pressure~~
~~LCS~~

TSR Safety Limits Example Discussion

A safety limit (SL) controls a process variable that is directly measurable and continuously observable. In this example, the reactor coolant system (RCS) is a primary barrier to the release of radiation. The piping and welds of this system are designed and built to withstand pressures up to 1,000 psia. Exceeding this pressure could breach the RCS or weaken RCS piping to a degree that risks catastrophic failure. Exceeding this value is a TSR violation and requires taking these three steps:

1. Go to SHUTDOWN mode IMMEDIATELY;
2. Notify the DOE CSO within one hour of reaching SHUTDOWN mode; and,
3. Prohibit facility operation until authorized by DOE.

A single column format usually suffices for a safety limit it is a single variable, the required actions are always the same, and it is important not to mislead the user into thinking that performance of the actions within the specified times would result in avoidance of a TSR violation. There are no surveillances for a safety limit because the variable being limited is continuously monitored.

3/4.4 LIMITING CONTROL SETTINGS

3/4.4.3 COOLANT PRESSURE

LCS: Maintain Coolant system below 100 psia

MODE APPLICABILITY: All Modes.

ACTIONS:

CONDITION	REQUIRED ACTION	COMPLETION TIME
Pressure > 100 psia	~~Open Relief Valve~~Reduce pressure to ≤ 100 psia	15 minutes

SURVEILLANCE REQUIREMENTS

SURVEILLANCE REQUIREMENT	FREQUENCY
SR 3/4.2.3.1 Verify ~~Pres.~~Pressure < 100 psia	~~Shiftly (each~~ Each shift~~)~~
SR 3/4.2.3.2 ~~Verify Pres.~~CALIBRATE Pressure Relief Valve and verify Set Point = 95 +/- 4 psia	~~Shiftly (each shift)~~ Annually

~~HFR TSR 3/4.4-11 Rev. 0 9/13/01~~

Figure ~~9b~~5. Example of Limiting Control Settings in Three-Column Format.

~~Heating Glovebox~~
~~LCO~~

~~3/4.3 LIMITING CONDITIONS FOR OPERATION~~

~~3.2 HEATING GLOVEBOX TEMPERATURE SHUTOFF CONTROL SYSTEM~~

~~**LCO:** Each Heating Glovebox shall have two OPERABLE Heating Glovebox Temperature Control Shutoff systems and one OPERABLE temperature recorder.~~

~~**MODE APPLICABILITY:** Operation and Maintenance when unstable materials are present in the heating glovebox and plutonium is present~~

~~**ACTIONS:**~~

~~**CONDITION**~~	~~**REQUIRED ACTION**~~	~~**COMPLETION TIME**~~
~~A. One heating glovebox temperature control shutoff is not OPERABLE~~ ~~**OR**~~ ~~the temperature recorder is not OPERABLE~~	~~A.1 Shutoff power to the heaters in the affected heating glovebox.~~ ~~**AND**~~ ~~A.2 Repair the affected heating glovebox and equipment~~	~~**IMMEDIATELY**~~ ~~Before returning power to the heaters in the affected heating glovebox.~~
~~B. Both heating glovebox temperature control shutoffs are not OPERABLE.~~	~~B.1 Shutoff power to the heaters in the affected heating glovebox.~~ ~~**AND**~~ ~~B.2 Repair the affected heating glovebox and equipment.~~	~~**IMMEDIATELY**~~ ~~Before returning power to the heaters in the affected heating glovebox.~~

~~TSR 3/4.3-16 Rev. 0 9/13/01~~

~~**Figure 10a. Example of LCO for Heating Glovebox.**~~

~~ECCS~~
~~LCO~~

~~3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)~~

~~3/4.5.2 ECCS-OPERATING~~

~~LCO:~~ ~~Two ECCS trains shall be OPERABLE~~

~~MODE APPLICABILITY:~~ ~~MODES 1 and 2~~
~~MODE 3 with pressurizer pressure < [1700] psia.~~

~~ACTIONS:~~

~~CONDITION~~	**~~REQUIRED ACTION~~**	**~~COMPLETION TIME~~**
~~A. One or more trains inoperable.~~ **~~OR~~** ~~At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train is available.~~	~~A.1 Restore train(s) to~~ **~~OPERABLE~~** ~~status.~~	~~72 hours~~
~~B. Required Action and associated Completion Time not met.~~	~~B.1 Be in MODE 3.~~ **~~AND~~** ~~B.2 Reduce pressurizer pressure to < [1700] psia.~~	~~6 hours~~ ~~12 hours~~

~~HFR TSR 3/4.5-11 Rev. 0 9/13/01~~

~~Figure 10b. Example of LCO in Three-Column Format.~~

Limiting Control Settings Example Discussion

Limiting Control Settings (LCS) control process variables in safety systems to prevent exceeding SLs. This example LCS is associated with the previous SL example and is a control on the same process variable, namely, system pressure. In this instance, the automatic pressure relief valve is set to open at 95 psia. To exceed this operating limit, the valve has either failed to operate as designed or the pressure transient is beyond the relief valve's capability.

A specified LCS needs to be chosen with consideration of exceedance; in response to exceeding the limit, the required action (either automatic or manual) must correct the abnormal situation before its associated SL is exceeded. Providing at least one LCS with each SL ensures that an SL cannot be exceeded without first exceeding an LCS.

LCSs always follow the general LCOs because the rules for applying LCOs apply also to LCSs. LCSs also are placed before any LCOs as they protect the maximum operating range for the process variables they represent.

GENERAL LIMITING CONDITIONS FOR OPERATION (LCOS) 3.0~~.X~~

LCO 3.0.1 LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2.

LCO 3.0.2 Upon discovery of a failure to meet an LCO, the associated ACTIONS shall be met~~.~~, except as provided in LCO 3.0.5 and LCO 3.0.6. If the LCO is restored or is no longer applicable before the specified completion time(s) expires, completion of the ACTION is not required, unless otherwise stated.

The Completion Time(s) for Required Action(s) are also applicable when a system or component is intentionally removed from service. Acceptable reasons for intentionally entering Required Action(s) for an LCO include, but are not limited to, performance of SRs, preventive maintenance, corrective maintenance, or investigation of operational problems.

LCO 3.0.3 When an LCO statement is not met and the associated ACTIONS are not met, or when an associated ACTION is not provided, the facility shall be placed in a MODE or other specified condition in which the LCO is not applicable. If the LCO is applicable in all MODES, the facility shall be placed in the safest MODE. Activities shall be initiated to place the affected PROCESS AREA(S) or facility in STANDBY within 1 hour. The affected PROCESS AREA or facility shall be in STANDBY within 12 hours.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the ACTIONS required by LCO 3.0.3 are not required.

LCO 3.0.3 is applicable in all MODES. Exceptions to LCO 3.0.3 may be stated in the individual LCOs.

LCO 3.0.4 When an LCO is not met, a MODE or other specified condition in the Applicability shall not be entered, except when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. LCO 3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS~~.~~ or that are part of a shutdown of the affected PROCESS AREA(S) or facility.

~~Exceptions to LCO 3.0.4 are stated in the individual LCOs. When an individual LCO states that LCO 3.0.4 does not apply, it allows entry into MODES or other specified conditions in the Applicability when the associated ACTIONS to be entered permit operation in the MODE or other specified condition for only a limited time.~~

~~LCO 3.0.5~~ ~~Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to~~

~~demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.~~

~~LCO 3.0.6 When a support system is declared inoperable, the supported systems are also required to be declared inoperable. However, only the support system's ACTIONS are required to be entered, provided they reflect the supported system's degraded safety condition. This is a clarification of the definition of OPERABILITY.~~

(Note: Continued on Next Page)

Figure ~~11a~~6a. Example of General Application LCOs (Page 1).

GENERAL LIMITING CONDITIONS FOR OPERATION (LCOS) 3.0

Exceptions to LCO 3.0.4 are stated in the individual LCOs. When an individual LCO states that LCO 3.0.4 does not apply, it allows entry into MODES or other specified conditions in the Applicability when the associated ACTIONS to be entered permit operation in the MODE or other specified condition for only a limited time.

LCO 3.0.5 Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.

LCO 3.0.6 When a support system is declared inoperable, the supported systems are also required to be declared inoperable. However, only the support system's ACTIONS are required to be entered, provided they reflect the supported system's degraded safety condition. This is an exception to LCO 3.0.2 for the supported system.

Figure 6a. Example of General Application LCOs~~.~~ (Page 2).

4.0~~.X~~ GENERAL SURVEILLANCE

~~3/4 OPERATING LIMITS AND SURVEILLANCE REQUIREMENTS~~

~~3/4.0 GENERAL APPLICATION~~

SURVEILLANCE REQUIREMENTS

SR 4.0.1 SURVEILLANCE REQUIREMENTS shall be met during the Operational Modes or other conditions specified for individual LCS and LCOs unless otherwise stated in an individual SURVEILLANCE REQUIREMENT.~~-~~ Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performances of the Surveillance, shall be failure to meet the LCO, except as provided in SR 4.0.3. Surveillances do not have to be performed on inoperable equipment or variables outside specified limits.

SR 4.0.2 Each SURVEILLANCE REQUIREMENT shall be performed ~~with~~within the specified frequency. The specified frequency for each SR is met if the Surveillance is performed within 1.25 times the interval specified in the frequency, as measured from the previous performance or as measured from the time a specified condition of the frequency is met.

For frequencies specified as "once," the above interval extension does not apply.

If a Completion Time requires periodic performance on a "once per . . ." basis, the above frequency extension applies to each performance after the initial performance.

Exceptions to this Specification are stated in the individual Specifications.

4.0.3 Failure to perform a SURVEILLANCE REQUIREMENT within 1.25 times the specified time interval (TSR violation) shall constitute a failure to meet the OPERABILITY requirements for a LIMITING CONDITION FOR OPERATION. ~~Exceptions are stated in~~ The LCO ACTIONS shall be entered at the ~~individual requirements. Surveillances do~~time it is determined that the SR has not ~~have to be~~been performed ~~on inoperable equipment.~~ or is not met, except as provided below.

If it is discovered that a Surveillance was not performed within its specified Frequency, then compliance with the requirement to declare the LCO not met may be delayed, from the time of discovery, up to 24 hours or up to the limit of the specified Frequency, whichever is less. This delay period is permitted to allow performance of the Surveillance.

(Note: Continued on Next Page)

Figure 6b. Example of General Application for Surveillance (Page 1).

	If the Surveillance is not performed within the delay period, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered. When the Surveillance is performed within the delay period and the Surveillance is not met, the LCO must immediately be declared not met, and the applicable Condition(s) must be entered.
SR 4.0.4	Entry into an Operational Mode or other specified condition shall not be made unless the SURVEILLANCE REQUIREMENT(S) associated with the LIMITING CONDITION FOR OPERATION has been performed within the stated surveillance interval or as other otherwise specified.- When an LCO is not met due to Surveillances not having been met, entry into a MODE or other specified condition in the Applicability shall only be made in accordance with LCO 3.0.4.

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Figure ~~11b~~6b. Example of General Application for Surveillance~~.~~ (Page 2).

~~Pressurizer Safety Valves~~
~~SRs~~

~~SURVEILLANCE REQUIREMENTS~~

B 3/4.0 General Limiting Conditions for Operation and Surveillance Requirements

Background Summary

LCOs 3.0.1 through 3.0.6 establish the general requirements applicable to all LCOs and apply at all times, unless otherwise stated.

LCO 3.0.1

LCO 3.0.1 establishes the APPLICABILITY statements within each LCO as the requirement for when to the LCO is required to be met (i.e., when the facility is in the MODES or other specified conditions of the Applicability statement of each LCO).

LCO 3.0.2

LCO 3.0.2 establishes that, upon discovery of a failure to meet an LCO, the associated ACTIONS shall be met. The Completion Time of each Required Action for an ACTIONS Condition is applicable from the point in time that an ACTIONS Condition is entered. The Required Actions establish those remedial measures that must be taken within specified Completion Times when the requirements of an LCO are not met.

This LCO establishes that:

a) Completion of the Required Actions within the specified Completion Times constitutes compliance with an LCO, and
b) Completion of the Required Actions is not required when an LCO is met within the specified Completion Time, unless otherwise specified.

LCO 3.0.2

There are two basic types of ACTIONS. The first type of ACTION specifies a time limit in which the LCO SHALL be met or additional ACTION is needed. This time limit is the COMPLETION TIME to restore an INOPERABLE system or component to OPERABLE status or to restore variables to within specified limits. If this type of ACTION is not completed within the specified COMPLETION TIME, the facility may be required to be placed in an operating configuration in which the LCO is not applicable. Whether stated as an ACTION or not, restoration of INOPERABLE equipment or a CONDITION to within limits is an ACTION that may always be considered on entering LCO ACTIONS.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 1).

Some LCO ACTIONS specify a COMPLETION TIME to initiate ACTION to place the facility in a specified MODE or other safe condition. This wording allows building operations a reasonable amount of time to determine what actions are necessary, to determine the correct course of action to safely perform the necessary actions, and to perform any necessary administrative functions associated with the actions. When COMPLETION TIMES were not specified for completion of facility reconfiguration or MODE change to allow reasonable operational flexibility, the intent is not to delay placing the facility in a safe condition or MODE. Necessary actions should be completed in a minimum time frame and not extended for operational convenience.

The second type of ACTION specifies remedial measures that permit continued operation of the facility without further restriction by the COMPLETION TIME of the ACTION. In this case, conformance to the ACTION provides an acceptable level of safety for continued operation.

Completion of ACTIONS is not required when an LCO is met or is no longer applicable within the associated COMPLETION TIMES, unless otherwise stated in the individual LCO.

The nature of some ACTIONS for some CONDITIONS necessitates that, once the CONDITION is entered, ACTIONS SHALL be completed even though the associated CONDITIONS are resolved. The ACTIONS of the individual LCOs specify where this is the case.

The COMPLETION TIMES of the ACTIONS are also applicable when a system or component is intentionally taken OUT-OF-SERVICE. The reasons for intentionally relying on the ACTIONS include, but are not limited to, performance of SURVEILLANCES, preventative or corrective maintenance, or investigation of operational problems. ACTIONS for these reasons SHALL be performed in a manner that does not compromise safety.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 2).

LCO 3.0.2 When a change in MODE or other specified condition is required to comply with Required Actions, the facility may enter a MODE or other specified condition in which a new LCO becomes applicable. In this case, the Completion Times of the associated Required Action would apply from the point in time that the new LCO becomes applicable, and any Condition(s) are entered.

LCO 3.0.3 LCO 3.0.3 establishes the ACTIONS that SHALL be implemented when an LCO is not met.

- Associated ACTIONS and COMPLETION TIMES are not met and no other CONDITION applies.

- The CONDITION of the facility is not specifically addressed by the associated ACTIONS. This means that no combination of CONDITIONS stated in the ACTIONS corresponds exactly to the actual CONDITION of the facility. Sometimes possible combinations of CONDITIONS are such that entering LCO 3.0.3 is warranted; in such cases, the ACTIONS specifically state a CONDITION corresponding to such combinations and also that LCO 3.0.3 must be entered

This LCO is intended to provide a “safe-harbor” provision when either the ACTION cannot be complied with, or the ACTION cannot be complied with within the specified COMPLETION TIME when an LCO is not met. It also provides a default ACTION when the facility is in a condition that is indeterminate, or is not readily categorized into the specified limits of an LCO. Entry into LCO 3.0.3 and completion of the associated ACTIONS within the required COMPLETION TIME does not in and of itself constitute a VIOLATION of a TSR.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 3).

LCO 3.0.3 This LCO delineates the time limit to initiate ACTION for placing the facility in a safe operating configuration when operation cannot be maintained within the limits for safe operation, as defined by the LCO and its ACTIONS. It is not an operational convenience that permits routine, voluntary removal of redundant or standby systems or components from service in lieu of other alternatives that would result in redundant or standby systems or components being OPERABLE.

Upon entry into LCO 3.0.3, one hour is allowed to prepare for a change in facility operation. The time limit specified to initiate actions permits the change to proceed in a controlled and orderly manner that is well within the capabilities of the facility. This reduces the potential for a facility upset that could challenge safety systems under operating configurations to which this LCO applies.

Change in facility operation required in accordance with LCO 3.0.3 may be orderly terminated and LCO 3.0.3 exited, if any of the following occurs:

- The LCO is now met.
- A CONDITION exists for which the ACTION has been performed.
- ACTIONS exist that do not have expired COMPLETION TIMES. These COMPLETION TIMES are applicable from the point in time that the CONDITION was initially entered and not from the time LCO 3.0.3 is exited.

The time limit of LCO 3.0.3 allows one hour to initiate action to place the facility in a safe operating configuration and 12 hours to complete the action.

The exceptions to LCO 3.0.3 are provided in instances where requiring a facility change in accordance with LCO 3.0.3 would not provide appropriate remedial measures for the associated CONDITION of the facility. These exceptions are addressed in the individual LCOs.

LCO 3.0.4 LCO 3.0.4 establishes limitations on changes in MODES or other specified conditions in the Applicability when an LCO is not met. It precludes placing the facility in a different MODE or other specified condition when the following exists:

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 4).

- The requirements of an LCO in the MODE or other specified condition to be entered are not met.
- Continued noncompliance with these requirements would result in requiring that the unit be placed in a MODE or other specified condition in which the LCO does not apply to comply with the ACTIONS.

Compliance with ACTIONS that permit continued operation of the facility for an unlimited period of time in an applicable MODE or other specified condition provides an adequate level of safety for continued operation. This is without regard to the status of the facility before or after the MODE change. Therefore, in such cases, entry into a MODE or other condition the Applicability may be made in accordance with the provisions of the ACTIONS. The provisions of this LCO shall not be interpreted as endorsing the failure to exercise the good practice of restoring systems or components to OPERABLE status before facility startup.

LCO 3.0.4 The provisions of LCO 3.0.4 shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS.

Exceptions to LCO 3.0.4 are stated in individual LCOs. Exceptions may apply to all the ACTIONS or to a specific ACTION of an LCO.

When changing MODES or other specified conditions while in a condition (in compliance with LCO 3.0.4 or where an exception to LCO 3.0.4 is stated) the ACTIONS define the remedial measures that apply. SURVEILLANCES do not have to be performed on the associated INOPERABLE equipment (or on variables outside the specified limits), as permitted by SR 4.0.1. Therefore a change in MODE or other specified condition in this situation does not violate SR 4.0.1 or SR 4.0.4 for those SURVEILLANCES that do not have to be performed because of the associated INOPERABLE equipment. However, SRs SHALL be met to demonstrate OPERABILITY before declaring the associated equipment OPERABLE (or variable within limits) and restoring compliance to the affected LCO.

LCO 3.0.5 LCO 3.0.5 establishes the allowance of restoring equipment to service under administrative/procedural controls when it has been removed from service or declared INOPERABLE to comply with ACTIONS. The sole purpose of this LCO is to provide an exception to LCO 3.0.2 to allow the performance of SURVEILLANCE REQUIREMENTS to DEMONSTRATE the following:

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 5).

- OPERABILITY of the equipment being returned to service; or
- OPERABILITY of other associated equipment.

An example of DEMONSTRATING the OPERABILITY of other equipment is taking an INOPERABLE channel or trip system out of the tripped condition to prevent the trip function from occurring during the performance of a SURVEILLANCE REQUIREMENT on another channel in the other trip system. ANOTHER similar example of DEMONSTRATING the OPERABILITY of other equipment is taking a channel out of the tripped condition to permit the logic to function and indicating the appropriate response during performance of a SURVEILLANCE REQUIREMENT on another channel in the same trip system.

LCO 3.0.6 LCO 3.0.6 establishes an exception to LCO 3.0.2 for support systems that have an

LCO or ACTION statement specified in the TSR. This exception is necessary because LCO 3.0.2 requires that the CONDITIONs and ACTIONs of the associated INOPERABLE supported system LCO be entered solely from the INOPERABILITY of the support system. This exception is justified because the ACTIONs that are required to ensure that the facility is maintained in a safe operating configuration are specified in the support system ACTIONS. These ACTIONS may include entering the supported system's CONDITIONs and ACTIONs or may specify other ACTIONs.

When a support system is INOPERABLE and there is no LCO or Action statement specified for it in the TSR, the effects on the supported system(s) operability is required to be evaluated and a formal declaration made. However, it is not necessary to enter into the supported system's CONDITIONs and ACTIONs unless directed to do so by the support system's ACTIONS. The confusion and inconsistency of interpretation of requirements related to the entry into multiple CONDITIONs and ACTIONs SHALL be eliminated by providing all actions that are necessary to be taken to ensure that the facility is maintained in a safe operating configuration in the support system's ACTIONS.

When a support system is INOPERABLE and there is no LCO specified for it, the impact of the degradation of the support system function on the supported systems' OPERABILITY SHALL be evaluated.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 6).

The degradation of the support system may or may not affect the OPERABILITY of the supported systems. OPERABILITY of the supported system SHALL depend on the intended function of the supported system and the level of support that the supported system provides. Unless otherwise justified (on determination that the supported system is INOPERABLE), the CONDITIONs and ACTIONs of the supported system's LCO SHALL apply or other compensatory actions or requirements SHALL apply, as otherwise justified.

Administrative/procedural controls are to ensure the time the equipment is returned to service in conflict with the requirements of the ACTIONS is limited to the time absolutely necessary to perform the allowed SURVEILLANCE REQUIREMENT. This LCO does not provide time to perform any other preventive or corrective maintenance.

Background Summary

SRs 4.0.1 through 4.0.4 establish the general requirements applicable to all SURVEILLANCE REQUIREMENTs and apply at all times, unless stated otherwise. The general requirements contained in LCOs 4.0.1–4.0.4 provide overall rules to guide the use and application of the specific requirements of the LCOs in Section 4.0 of the TSR. When exceptions to the general requirements contained in LCOs 4.0.1–4.0.4 are allowed, they are stated as notes in the individual LCO.

SR 4.0.1

SR 4.0.1 establishes that SURVEILLANCE REQUIREMENTS must be met during the MODES or other specified operating conditions in the APPLICABILITY statements for individual LCOs, unless otherwise stated in the individual SURVEILLANCE REQUIREMENTS. This SR ensures that SURVEILLANCES are performed to VERIFY the OPERABILITY of systems and components, and that variables are within specified limits. Failure to meet a SURVEILLANCE REQUIREMENT within the specified FREQUENCY, in accordance with SR 4.0.2, constitutes a failure to meet an LCO.

Systems and components are assumed to be OPERABLE when the associated SURVEILLANCE REQUIREMENTS have been met. Nothing in this SR, however, is to be construed as implying that systems or components are OPERABLE when:

- The systems or components are known to INOPERABLE, although still meeting the SRs; or
- The requirements of the SURVEILLANCE(s) are not met between required SURVEILLANCES performances.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 7).

SURVEILLANCES do not have to be performed when facility is in a MODE or other specified operating configuration for which the requirements of the associated LCO are not applicable, unless otherwise specified. SURVEILLANCES, including SURVEILLANCES invoked by ACTIONS, do not have to be performed on INOPERABLE equipment because the sole purpose of a SURVEILANCE is to determine OPERABILITY. If the equipment has been declared INOPERABLE and/or out-of-service, an OPERABILITY determination has already been made. ACTIONS because of the equipment INOPERABILITY define the remedial measures that apply. SURVEILLANCE REQUIREMENTs have to be met in accordance with SR 4.0.2 before returning equipment to OPERABLE status.

Measurement devices used to DEMONSTRATE compliance with LCO SRs SHALL be calibrated to plant design, manufacturer's specifications and/or industry standards as described in the Laboratory Calibration Program. SURVEILLANCE REQUIREMENT results SHALL be documented in an auditable and traceable manner.

SR 4.0.1 Upon completion of maintenance, appropriate post-maintenance testing is required to declare equipment OPERABLE. This includes meeting applicable SURVEILLANCE REQUIREMENTS in accordance with SR 4.0.2. Post-maintenance testing may not be possible in the specified operating configuration in the APPLICABILITY because the necessary facility parameters were not established.

In these situations, the equipment may be considered OPERABLE provided testing has been satisfactorily completed to the extent possible and that the equipment is not otherwise believed to be incapable of performing its function. This will allow operation to proceed to a specified operating configuration where other necessary post maintenance tests can be completed.

A SURVEILLANCE REQUIREMENT that requires removal of equipment from service does not constitute failure to meet an LCO. Individual SURVEILLANCE procedures SHALL describe appropriate limitations beyond which an out-of-tolerance CONDITION would exist.

SR 4.0.2 SR 4.0.2 establishes the requirements for meeting the specified FREQUENCY for SURVEILLANCES. Surveillance frequencies should be based on historical data, engineering or manufacturer's information or safety analysis to allow the longest reasonable time period between SURVEILLANCEs to ensure OPERABILITY. Failure to perform the SURVEILLANCE REQUIREMENTS within the specified FREQUENCIES may allow operation beyond the assumptions specified in the DSA.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 8).

SR 4.0.3 SR 4.0.3 permits a 25% extension of the interval specified in the SURVEILLANCE REQUIREMENTS FREQUENCY. This SR is designed to facilitate SURVEILLANCE REQUIREMENT scheduling in conditions where performance would represent an operational hardship or cause an unsafe transient. It allows consideration of facility operating conditions that may not be suitable for conducting the SURVEILLANCE REQUIREMENT (e.g., transient states or other ongoing SURVEILLANCE REQUIREMENTS or maintenance activities).

The 25% extension does not significantly degrade the reliability that results from performing the SURVEILLANCE REQUIREMENT at its specified FREQUENCY. This is based on the recognition that the most probable result of any particular SURVEILLANCE REQUIREMENT being performed is the VERIFICATION of conformance with the SURVEILLANCE REQUIREMENTS. The exceptions to SR 4.0.3 are those SURVEILLANCE REQUIREMENTS for which the 25% extension of the interval specified in the FREQUENCY does not apply. These exceptions are stated in the individual SURVEILLANCE REQUIREMENTS.

An example of where SR 4.0.3 does not apply is a SURVEILLANCE REQUIREMENT with a FREQUENCY of "in accordance with another DOE regulation." The requirements of regulations take precedence over the TSR. The TSR cannot, in and of itself, extend a test interval specified in the regulations. Therefore, there would be a Note: in the FREQUENCY stating, "SR 4.0.3 is not applicable."

SR 4.0.3 The provisions of SR 4.0.3 are not intended to be used repeatedly merely as an operational convenience to extend SURVEILLANCE REQUIREMENT intervals or periodic COMPLETION TIME intervals beyond those specified

SR 4.0.3 establishes the flexibility to defer declaring AFFECTED equipment INOPERABLE or an affected variable outside the specified limits when SURVEILLANCE has not been completed within the specified FREQUENCY. A delay period of up to 24-hours applies from the time it is discovered that the SURVEILLANCE has not been performed, in accordance with SR 4.0.2, and not at the time the specified FREQUENCY was not met.

To avoid subjecting the facility to unnecessary transients, upon discovery of a missed SURVEILLANCE, 24 hours or the time limit of the specified SURVEILLANCE FREQUENCY, whichever is less, is allowed to complete the SURVEILLANCE before taking the required ACTION of the LCO. This delay period provides an adequate time limit to complete missed SURVEILLANCES.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 9).

This delay period permits the completion of a SURVEILLANCE before compliance with ACTIONS or other remedial measures would be required that may preclude completion of the SURVEILLANCE. The basis for this delay period includes consideration of facility operating configuration, adequate planning, availability of personnel, the time required to perform the SURVEILLANCE, the safety significance of the delay in completing the required SURVEILLANCE, and the recognition that the most probable result of any particular SURVEILLANCE being performed is the VERIFICATION of conformance with the SURVEILLANCE REQUIREMENTS. When a SURVEILLANCE with a FREQUENCY, based not on time intervals but on specified facility CONDITIONS or operational situations, is discovered not to have been performed when specified, SR 4.0.3 allows the full 24-hour delay period in which to perform the SURVEILLANCE.

The provisions of SR 4.0.3 also provide a time limit for completion of SURVEILLANCES that become applicable as a consequence of changes imposed by ACTIONS.

Failure to comply with specified frequencies for SURVEILLANCE REQUIREMENTS is expected to be an infrequent occurrence. Use of the delay period established by SR 4.0.3 is a flexibility that is not intended to be used as an operational convenience to extend SURVEILLANCE intervals. This extension also does not preclude notification of a VIOLATION of SR 4.0.2.

This allows performance of SURVEILLANCE REQUIREMENTS when the prerequisite CONDITIONS specified in a SURVEILLANCE REQUIREMENT procedure require entry into the MODE or other specified operating configuration in the APPLICABILITY Statements of the associated LCO prior to the performance or completion of a SURVEILLANCE REQUIREMENT. A SURVEILLANCE REQUIREMENT, which could not be performed until after entering the LCO APPLICABILITY statements, would have its FREQUENCY specified such that it is not "due" until the specific operating configuration needed is met. Alternately, the SURVEILLANCE REQUIREMENT may be stated in the form of a note as not required (to be met or performed) until a particular event, operating configuration, or time has been reached.

(Note: Continued on Next Page)

Figure 6c. Example of General Application LCO Bases (Page 10).

SR 4.0.3	If a SURVEILLANCE REQUIREMENT is not completed within the allowed delay period, the equipment is considered not OPERABLE or the variable is considered outside the specified limits and the COMPLETION TIMES of the ACTIONS for the applicable LCO CONDITIONS begin IMMEDIATELY upon expiration of the delay period. If a SURVEILLANCE REQUIREMENT is failed within the delay period, then the equipment is INOPERABLE, or the variable is outside the specified limits and the COMPLETION TIMES of the ACTIONS for the applicable LCO CONDITIONS begin IMMEDIATELY upon the failure of the SURVEILLANCE REQUIREMENT. Completion of the SURVEILLANCE REQUIREMENT within the delay period allowed by this LCO, or within the COMPLETION TIMES of the ACTIONS, restores compliance with SR 4.0.1.
SR 4.0.4	SR 4.0.4 establishes the requirement that all applicable SURVEILLANCE REQUIREMENTS must be met before entry into a MODE or other specified operating configuration in the APPLICABILITY Statements. This SURVEILLANCE REQUIREMENT ensures that system and component OPERABILITY requirements and variable limits are met before entry into a MODE or other specified operating configuration in the APPLICABILITY Statements for which these systems and components ensure safe operation of the facility. This SURVEILLANCE REQUIREMENT applies to changes in MODES or other specified operating configurations in the APPLICABILITY Statements associated with the facility. The provisions of SR 4.0.4 SHALL not prevent changes in MODES or other specified operating configurations in the APPLICABILITY Statements that are required to comply with the ACTIONS. The precise requirements for performance of SURVEILLANCE REQUIREMENTS are specified such that exceptions to SR 4.0.4 are not necessary. The specific time frames and CONDITIONS necessary for meeting the SURVEILLANCE REQUIREMENTS in accordance with the requirements of SR 4.0.4 are specified in the FREQUENCY, in the SURVEILLANCE REQUIREMENT, or both.

Figure 6c. Example of General Application LCO Bases (Page 11).

General Limiting Conditions for Operation and Surveillance Requirements Example Discussion

General LCOs (Sections 3.0.1 through 3.0.6 in the main text) and general SRs (Sections 4.0.1 through 4.0.4 in the main text) establish rules generally applicable to all LCOs and SRs. Because these rules provide a framework for applying the facility-specific LCOs and SRs, they should be considered when developing specific LCOs and SRs. They are placed at the front of Section 3/4 to indicate their applicability to later sections. These rules do not apply to other sections of the TSR unless specifically invoked by those sections. Example: "NOTE: SR 4.0.3 is applicable to the following ISIs."

The general rules cause the specific LCO requirements to be applied uniformly and function effectively. These rules and their choice of specific words reflect long experience and hence should be used as presented unless specific circumstances dictate otherwise. The most common exception to this principle is the "safest mode" and required action times of LCO 3.0.3. These particular values should be tailored to the specific facility safety basis.

More flexibility exists with respect to the general LCO bases, though changes should be deliberate and purposeful. They are presented here to assist the user in interpreting the general LCOs.

~~SURVEILLANCE REQUIREMENT~~	~~FREQUENCY~~
~~SR 3/4.5.10.1 Verify each pressurizer safety valve is OPERABLE as per In-service Testing Program. After testing, lift settings must be within 1%.~~	~~Shiftly (each shift)~~

3/4.1 MATERIAL AT RISK (MAR) Inventory Control

3.1.1 FACILITY MAR Limits

LCO: MAR inventory SHALL meet the following limits:

1. Total FACILITY MAR ≤ 10,000 g ^{239}PuE
2. YARD MAR ≤ 2,000 g ^{239}PuE.

NOTE

MAR in TRANSFER within the FACILITY structure is counted upon reaching its final destination. MAR in TRANSFER in the YARD is counted against the applicable YARD limit while in TRANSFER.

MODE APPLICABILITY: All MODES

AREA APPLICABILITY: FACILITY

PROCESS APPLICABILITY: N/A

ACTIONS

CONDITION	ACTIONS	COMPLETION TIME
A. MAR inventory exceeded.	A.1 VERIFY fire suppression system is OPERABLE in the affected area.	1 hour
	AND	
	A.2 VERIFY combustible loading meets limits in the affected area.	1 hour
	AND	
	A.3 Initiate a FIRE WATCH in the affected area.	4 hours

	AND A.4 Restore inventory to within limits.	72 hours

(Note: Continued on Next Page)

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Figure ~~11c~~7a. Example of ~~Surveillance Requirements in Two-Column Format.~~

~~3/4.3 FIRE DETECTION AND SUPPRESSION~~

~~3.3.1 FIRE DETECTION INSTRUMENTATION~~

SAC LCO~~: The fire detection instrumentation, associated isolation damper interlocks, and alarm system for each fire area in Table 3.3.1-1 shall be OPERABLE.~~ **(Page 1).**

~~**AND**~~

~~At least half of the total fire detectors in a fire area shall be OPERABLE.~~

~~**MODE APPLICABILITY:** OPERATION, STANDBY, PARTIAL SHUTDOWN, FULL SHUTDOWN, and OUTAGE~~

~~**PROCESS AREA APPLICABILITY:** [area 1]~~

~~**ACTIONS:**~~

~~CONDITION~~	~~REQUIRED ACTION~~	~~COMPLETION TIME~~
~~A. More than half of the total fire detectors in a fire area are inoperable.~~	~~A.1 Restore the inoperable fire detectors to OPERABLE status.~~	~~14 days~~

<table>
<tr>
<td>~~B. The ACTION and associated completion time of Condition A are not met.~~

~~**OR**~~

~~C.~~A. ~~Two or more adjacent fire detectors in a fire area are inoperable.~~</td>
<td>
<table>
<tr><th>CONDITION</th><th>ACTIONS</th><th>COMPLETION TIME</th></tr>
<tr><td>B. ACTIONS and associated COMPLETION TIMES of CONDITION A not met</td><td>B.1 Place the affected AREA in STANDBY.

AND

B.2 Restore inventory to within limits.</td><td>IMMEDIATELY

7 days</td></tr>
</table>

~~B.1 Establish a fire watch patrol to inspect the area(s).~~

~~**AND**~~
~~B.2 Inspect the area(s).~~
</td>
<td>~~1 hour~~

~~Hourly~~</td>
</tr>
</table>

C. ACTIONS and associated COMPLETION TIMES of CONDITION B not met.	C.1 Place the affected AREA in SHUTDOWN.	30 days

4.1 SURVEILLANCE REQUIREMENTS

SR	Surveillance	FREQUENCY
4.1.1	VERIFY FACILITY MAR inventory ≤ 10,000 g ^{239}PuE.	M
4.1.2	VERIFY YARD MAR inventory ≤ 2,000 g ^{239}PuE.	M
4.1.3	Perform a physical reconciliation of MAR inventory	A

~~D. Any fire alarm or isolation damper interlock is inoperable.~~	~~C.1 Establish a fire watch patrol to inspect the area(s).~~ ~~AND~~ ~~C.2 Inspect the area(s).~~	~~15 minutes~~ ~~Hourly~~

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Figure ~~12~~7a. Example of ~~Fire Detection Instrumentation LCOs.~~SAC LCO (Page 2).

~~**3/4.3 FIRE DETECTION AND SUPPRESSION**~~

~~3.3.1 FIRE DETECTION INSTRUMENTATION (continued)~~

~~SURVEILLANCE REQUIREMENTS~~

~~SURVEILLANCE REQUIREMENT~~	~~FREQUENCY~~
~~SR 4.3.1.1 Perform a TRIP ACTUATING DEVICE OPERATIONAL TEST on each fire detector instrument.~~	~~Semiannually~~

B3/4.1 MATERIAL-AT-RISK LIMIT

~~SR 4.3.1.2 Demonstrate that the NFPA Standard 72D supervised circuits supervision associated with the detector alarms of each fire detection instrument are OPERABLE.~~**BACKGROUND SUMMARY**	~~Semiannually~~The MAR LCO establishes the maximum (or upper bound) quantity of materials at risk in terms of PuE on site at any one time and in any particular location at one time. These maximum quantities established the bases in all accident scenarios evaluated in Chapter 3 of the DSA.
~~SR 4.3.1.3 Demonstrate that the unsupervised circuits associated with the detector alarms between the instrument and the control room are OPERABLE.~~**APPLICATION TO SAFETY ANALYSIS**	~~Monthly~~MAR limits are placed on the yard and the facility. The physical form of the material is assumed to be metal. The goal is to ensure that the MAR is maintained at or below an appropriate level to maintain the potential consequences to the maximum exposed offsite individual (MEOI) from postulated accidents to below those evaluated in the DSA. Accident scenarios (selected from the entire list of breaches, leaks, fires, deflagrations, explosions, natural phenomena, and external event accidents, which includes an aircraft crash, evaluated in the DSA) result in bounding releases involving the entire facility, or specific locations within the facility.
LCO	The MAR limits LCO places restrictions on the amount of MAR that may be present at various locations within the facility. This limit is imposed to limit potential offsite doses from postulated bounding accident scenarios. The safety analysis assumed that the MAR limit is in vault and the work area.
APPLICABILITY	The LCO is applicable at all times.
CONDITION A, ACTIONs and	Condition A is entered when the amount of

COMPLETION TIMEs	MAR resident within the inventory is discovered to exceed the corresponding location limits specified in the LCO. Under this condition, ACTION A.1 through A.3 are entered with the objective of ensuring that a fire does not occur while A.4 works on reducing the inventory to below MAR limits. Verifying the operability of the FSS and compliance with combustible limits and establishing a fire patrol all lessen the opportunity or reduce the ramification of a fire. The first two of the compensatory actions must be implemented within 1 hours of time of declaration. ACTION A.4 requires removing excess MAR inventory from the location within 72 hours given the compensatory actions to reduce the threat of fire. The required
	(Note: Continued on Next Page)

Figure ~~13a~~7b. Example of ~~Fire Detection Instrumentation Surveillance Requirements.~~

~~3/4.3 FIRE DETECTION AND SUPPRESSION~~

~~3.3.~~**SAC LCO Bases (Page 1~~ FIRE DETECTION INSTRUMENTATION (continued)~~).**

~~**TABLE 3.3.1-1. Fire Detection Instruments**~~
~~**(for areas taken credit for in the safety analysis)**~~ ~~*Sheet 1 of 2*~~

B3/4.1 MATERIAL-AT-RISK LIMIT

CONDITION A, ACTIONs and COMPLETION TIMEs

~~**Total Number of Instruments**~~ACTION will limit the potential consequence of accidental relea exists when the noncompliance condition occurs. Removing the excess inventory lowers t would ensure the bounding of the analyses evaluated in the DSA.

This ACTION ensures that the inventory is less than or equal to the limits specified in the l reasonable COMPLETION TIME considering the need to arrange for removing the MAR facility. It is an acceptable period of time relative to the estimated FREQUENCY of bound total building inventory, such as natural phenomena accidents, large fires, and vehicle crasl

The required ACTIONS reduce the likelihood of accidents and the magnitude of potential accident conditions.

Condition B is entered when the ACTION A.4 cannot be met within its COMPLETION T B.1 is entered.

ACTION B.1 requires that the facility be placed in STANDBY MODE IMMEDIATELY. while the excess inventory is removed from the facility. The removal of the excess invento The frequency of fire is 1.75E-3 per year. Based on this frequency, the approximate proba during the 7-day period is 3.4E-5, which represents a low risk and makes the COMPLETIO

This compensatory ACTION reduces the likelihood of accidents and the magnitude of pote during accident conditions.

~~**Instrument Location [Illustrative]**~~ ***(Note: Continued on Next Page)*** ~~**Heat**~~

~~1. Primary Containment~~

~~a. Zone 1~~

~~b. Zone 2~~

~~c. Zone 3~~

~~2. Secondary Containment~~

~~a. Zone 1~~

~~b. Zone 2~~

~~c. Zone 3~~

~~3. Tertiary Containment~~

~~a. Zone 1~~

~~b. Zone 2~~

~~c. Zone 3~~

~~4. Gloveboxes~~

~~a.~~

~~b.~~

~~c.~~

~~5. Hot Cells~~

~~a.~~

~~b.~~

~~c.~~

~~6. Ventilation Ducts~~

~~a.~~

~~b.~~

~~c.~~

~~TSR 3/4.3-7 Rev. 0 9/13/01~~

Figure ~~13b.~~ 7b. Example of ~~Fire Detection Instrumentation Surveillance Requirements.~~

~~3/4.3 FIRE DETECTION AND SUPPRESSION~~

~~3.3.1 FIRE DETECTION INSTRUMENTATION (continued)~~

~~TABLE 3.3.1-1. Fire Detection Instruments~~
~~(for areas taken credit for in the safety analysis) (continued)~~ ~~*Sheet*~~**SAC LCO Bases (Page 2** ~~*of 2*~~**).**

~~Instrument Location [Illustrative]~~	~~Total Number of Instruments~~ Heat	Flame	Smoke
~~7. Battery Room~~			
~~a.~~			
~~b.~~			
~~c.~~			

~~8. Diesel Generators~~

~~a. Zone 1~~

B3/4.1 MATERIAL-AT-RISK LIMIT

CONDITION C, ACTIONs and COMPLETION TIMEs

~~b. Zone 2~~Condition C is entered when ACTION B.2 cannot be met within its COMPLETION TIME. ACTION C.1 directs the facility to enter SHUTDOWN within 30 days.

~~c. Zone 3~~

~~9. Engineered Safety Feature Cubicles(s)~~

~~a.~~

~~b.~~

~~c.~~

~~10. Safety-Related Instrumentation~~

~~a.~~

~~b.~~

~~c.~~

SURVEILLANCE REQUIREMENTS

SR 4.1.1

~~[List all detectors in area required to ensure the OPERABILITY of safety-related equipment]~~This SURVEILLANCE REQUIREMENT requires verification that the facility inventory is not exceeded once a month. This SR is intended to prevent any MAR within facility from exceeding the facility limit. Verification once a month that MAR inventory is within limits is judged to be acceptable given the small turnover rate of MAR.

SR 4.1.2

This SURVEILLANCE REQUIREMENT requires verification that the yard inventory is not exceeded once a month. This SR is intended to prevent any MAR within the yard from exceeding the MAR limit. Verification once a month that MAR inventory is within limits is judged to be acceptable given the small turnover rate of MAR.

SR 4.1.3

This SURVEILLANCE REQUIREMENT requires an inventory check for all MAR within the facility once a year and verification against the electronic MAR inventory.

This SR is intended to reduce likelihood of possible LCO VIOLATION by not knowing the MAR quantity on hand. This SR will reduce the likelihood of exceeding the LCO limit at a specified time.

REFERENCES

~~TSR 3/4.3-8 Rev. 0 9/13/01~~

Figure ~~13b.~~ 7b. Example of ~~Fire Detection Instrumentation Surveillance Requirements (continued).~~

~~Fire Suppression Water System~~

SAC ~~LCO~~ Bases (Page 3).

~~3/4.3 FIRE DETECTION AND SUPPRESSION~~

~~3.3.2 FIRE SUPPRESSION WATER SYSTEM~~

~~LCO:~~ ~~The Fire Suppression Water System shall be OPERABLE with—~~

- ~~a. At least [two] fire suppression pumps, each with a capacity of [2500] gpm, with their discharge aligned to the fire suppression header~~
- ~~b. Separate water supplies, each with a minimum usable volume of [ ] gallons~~
- ~~c. An OPERABLE flow path capable of taking suction from the [ ] tank and the [ ] tank and transferring the water through distribution piping with OPERABLE sectionalizing control or isolation valves to the yard hydrant curb valves, the last valve ahead of the water flow alarm device on each sprinkler or hose standpipe, and the last valve ahead of the deluge valve on each Deluge or Spray System required to be OPERABLE in accordance with LCO 3.2.5.~~

~~MODE APPLICABILITY:~~ ~~OPERATION, STANDBY, PARTIAL SHUTDOWN, FULL SHUTDOWN, and OUTAGE~~

~~PROCESS AREA APPLICABILITY: [~~~~area 2~~**~~]~~**

~~ACTIONS:~~

SAC LCO Example Discussion

This LCO is an example of a SAC in an LCO format. It is one of the more common SACs and often appears as the first LCO following the general LCO section. This LCO typically protects an assumption in the accident analysis regarding the maximum quantity and form of MAR involved in bounding accidents.

In this example, the primary accident of concern is a fire. The MAR limit in the yard is less than the MAR limit in the facility because less credit can be taken for structural mitigation in the yard. When the MAR limit is exceeded, the initial actions (A) are aimed at reducing the probability of a large fire during the short period (72 hrs) required to reduce the MAR below allowed limits. If this is not possible, the actions restrict the facility to modes in which the probability of an accident is reduced to a minimum.

This example reveals the value of a well-drafted bases section to an operator in understanding the LCO itself. The operator may not have the DSA readily available, and in off-normal conditions may not have the time needed to research the technical basis for the control of concern.

~~CONDITION~~	~~REQUIRED ACTION~~	~~COMPLETION TIME~~
~~A. One pump and or water supply is inoperable.~~	~~A.1.1 Restore the inoperable equipment to **OPERABLE** status.~~	~~5 days~~
	~~**OR**~~	
	~~A.1.2 Provide an alternative backup pump or supply.~~	~~7 days~~

~~B.~~A. ~~The Fire Suppression Water System is inoperable for reason other than those in Condition A.~~	(see center column)	~~24 hours~~

~~B~~3/4.3 FIRE SUPPRESSION SYSTEM

3.3.1 ~~Provide a backup~~Facility Fire Suppression ~~Water~~ System~~.~~

LCO: The Facility Fire Suppression System SHALL be OPERABLE as follows:

1. A static pressure ≥ 100 psig at the base of risers.
2. An unobstructed flow path from the water supply to the sprinklers.
3. Sprinkler Heads OPERABLE

NOTE

A separate entry CONDITION is allowed for each AFFECTED AREA

MODE APPLICABILITY: OPERATION and STANDBY MODES

AREA APPLICABILITY:

Inoperable SSC	AFFECTED AREA
Sprinkler System #1	North Wing (Sprinkler Coverage **Zone 1** supplied by Riser #1)
Sprinkler System #2	South Wing (Sprinkler Coverage **Zone 2** supplied by Riser #2)

PROCESS APPLICABILITY: N/A

ACTIONS

CONDITION	ACTIONS	COMPLETION TIME
A. Static pressure less than 100 psig at the base of risers.	A.1 Establish a FIRE WATCH in the affected AREA.	2 hours and every hour thereafter
OR	**AND**	

Loss of flow path from the water supply to the sprinklers	A.2 Conduct a combustible loading inspection in the affected AREA.	24 hours

(Note: Continued on Next Page)

~~TSR~~ ~~3/4.3-9~~ ~~Rev. 0 9/13/01~~

Figure ~~14~~8. Example ~~of~~ Fire Suppression ~~Water System~~ LCO~~.~~ (Page 1).

~~3/4.3 FIRE DETECTION AND SUPPRESSION~~

~~3.3.2 FIRE SUPPRESSION WATER SYSTEM (continued)~~

~~SURVEILLANCE REQUIREMENTS~~

~~SURVEILLANCE REQUIREMENT~~		~~FREQUENCY~~
~~SR 4.3.2.1~~	~~Verify that the contained water supply volume contains [ ] gallons.~~	~~Weekly~~
~~SR 4.3.2.2~~	~~On a STAGGERED TEST BASIS, start each electric motor-driven pump, and operate it for at least 15 minutes on recirculation flow.~~	~~Monthly~~
~~SR 4.3.2.3~~	~~Verify that each valve (manual, power-operated, or automatic) in the flow path is in its correct position.~~	~~Monthly~~
~~SR 4.3.2.4~~	~~Verify that a system flush was performed.~~	~~Semiannually~~
~~SR 4.3.2.5~~	~~Cycle each testable valve in the flow path through at least one complete cycle of full travel.~~	~~Annually~~
~~SR 4.3.2.6~~	~~Verify that each automatic valve in the flow path is actuated to its correct position.~~	~~18 Months~~
~~SR 4.3.2.7~~	~~Verify that each pump develops at least [2500] gpm at a system head of [250] feet~~	~~18 Months~~
~~SR 4.3.2.8~~	~~Cycle each valve in the flow path that is not testable during plant operation through at least one complete cycle of full travel.~~	~~18 Months~~
~~SR 4.3.2.9~~	~~Verify that each fire suppression pump starts sequentially to maintain the Fire Suppression Water System pressure ≥ [ ] psig.~~	~~18 Months~~

~~SR 4.3.2.10 Perform a flow test of the system in accordance with NFPA 25, Sections 3-3.1, 4-4.1.1, 5-3.3.1, 8-3.5, 94.3.2.2, 9-4.4.2.2.2, and Table 7-4, as applicable.~~ **ACTIONS** ~~3 Years~~

CONDITION	**ACTIONS**	**COMPLETION TIME**
OR Sprinkler Heads INOPERABLE	**AND** A.3 Restore FSS to OPERABLE.	 1 week
B. ACTIONS and completion times of Condition A not met.	B.1 Place the affected AREA in STANDBY MODE. **AND** B.2 Restore FSS to OPERABLE.	IMMEDIATELY 7 days
C. ACTIONS and completion times of Condition B not met.	C.1 Place affected AREA in SHUTDOWN MODE.	30 days

4.3 SURVEILLANCE REQUIREMENTS:

SR	**Surveillance**	**FREQUENCY**
4.3.1	VERIFY that the static gauge pressure is greater than 100 psig at the base of the riser.	D
4.3.2	Perform a Fire Suppression System control valve inspection and alignment VERIFICATION	M
4.3.3	Perform a main drain test	A
4.3.4	Perform a visual inspection of sprinkler heads and adjacent ceiling tiles.	A

Figure ~~15~~8. Example ~~of~~ Fire Suppression ~~Water~~LCO (Page 2).

Facility Fire Suppression System ~~Surveillance Requirements.~~LCO Example Discussion

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~~**3/4.1 CRITICALITY PREVENTION**~~

~~3.1.1 INVENTORY MATERIAL LIMIT IN PROCESS STREAM~~

~~**LCO:** The total FISSILE MATERIAL inventory in all gloveboxes and transport conveyors in the [facility] shall not exceed [ ] kg.~~

~~**MODE APPLICABILITY:** OPERATION, STANDBY, and PARTIAL SHUTDOWN~~

~~**PROCESS AREA APPLICABILITY:** [area 3]~~

~~**ACTIONS:**~~

An automatic fire suppression system is often found in TSRs for DOE nuclear facilities. The primary accident of concern in this example is a large fire.

The limiting conditions are:

B. Minimum riser static pressure – This condition ensures that there is enough water available for the system to perform its safety function. In facilities with dedicated tanks, this limit is often a minimum tank level instead of water quantity.
C. Unobstructed flowpath and operable sprinkler heads – This condition ensures that all sprinkler heads are supplied with water and in condition to operate.

When these conditions are not met, establishing a firewatch creates a temporary substitute for the system's safety function. Reducing combustibles further reduces the probability of a large fire. If the system cannot be restored, changing the operating mode may reduce the risk of a fire in the affected area. The surveillances verify that the limits are met. In this case, two surveillances are required for verifying an unobstructed flowpath. The valve line-up is an external surveillance to ensure that valve positions will permit flow. The main drain test is an indirect internal surveillance to ensure unobstructed flow in the piping itself.

The Bases are not included in this example for the sake of brevity. Typically, a fire suppression LCO Bases will involve calculations of the maximum fire's intensity and duration, required sprinkler flow and duration, and references to applicable fire protection standards.

~~CONDITION~~	~~REQUIRED ACTION~~	~~COMPLETION TIME~~
~~A. The FISSILE MATERIAL inventory limit for a glovebox is exceeded.~~	~~----- NOTE ------~~ ~~Action A.2 should involve the Criticality Safety Section.~~ ~~------------------~~	
	~~A.1 Enter STANDBY if in OPERATION, and stop all FISSILE MATERIAL transfers, handling, and sampling in the affected equipment.~~	~~IMMEDIATELY~~
	~~**AND**~~	
	~~A.2 Develop and implement an approved plan to return the affected gloveboxes or transport conveyors inventory to within bounds of the specified limit.~~3/4.4	~~Before resuming OPERATIO~~

3.4.1 STANDBY POWER DIESEL GENERATOR

LCO 3.4.1: The Standby Power Diesel Generator shall be OPERABLE.

~~OR~~

~~B.~~A. ~~B~~ ~~. The FISSILE MATERIAL inventory limit for the facility gloveboxes and transport conveyors is exceeded.~~ ~~N~~

MODE APPLICABILITY: All MODES

ACTIONS:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. The Standby Power Diesel Generator is inoperable.	A.1 Restore the Standby Power Diesel Generator to OPERABLE status.	8 Hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE REQUIREMENT		
SR 4.4.1.1	Verify that the starting battery [parameters] for the Standby Power Diesel Generator are within [limits].	
SR 4.4.1.2	Perform a start and load test on the Standby Power Diesel Generator.	
SR 4.4.1.3	Verify that Standby Power Diesel Generator fuel oil storage tank is filled to greater than or equal to [7] day supply of fuel.	W
SR 4.4.1.4	Verify diesel fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within the limits of the Diesel Fuel Oil Testing Program.	

~~TSR 3/4.1-11 Rev. 0 9/13/01~~

Figure ~~16~~9a. Example of ~~Criticality Prevention TSR~~Diesel Generator LCO.

~~**3/4.3 CRITICALITY PREVENTION**~~

~~3.3.1 INVENTORY MATERIAL LIMIT IN PROCESS STREAM (continued)~~

~~**ACTIONS (continued)**~~

~~**SURVEILLANCE REQUIREMENTS**~~

~~SURVEILLANCE REQUIREMENT~~B3/4.4 EMERGENCY POWER B3.4.1 STANDBY POWER DIESEL GENERATOR BASES		~~FREQUENCY~~
BACKGROUND SUMMARY	Backup power is automatically provided by a 300-kW diesel generator. Upon loss of normal power to either Motor Control Centers, MCC-A or MCC-B the transfer switch will automatically start the diesel generator and supply the ventilation exhaust fan. At a full-load fuel consumption the 550-gallon oil tank provides a service time of approximately 20 hours.	
~~SR 4.3.1.1 Verify that the posted inventory in each glove box and transport conveyor is not exceeded.~~APPLICATION TO SAFETY ANALYSIS	~~Shiftly (each shift)~~This LCO is applied to ensure that backup power from the Standby Power Diesel Generator is available to support the operation of a ventilation exhaust fan following a loss of normal power. Operation of an exhaust fan is necessary to maintain the exhaust tunnel pressures required by LCO 3.3.1, which are required to protect the offsite public and to prevent and mitigate the consequences of an air reversal.	
~~SR 4.3.1.2 Verify that the posted glovebox limit or transport conveyor limit will not be exceeded by beginning a new batch, transfer, or process operation in that equipment.~~LIMITING CONDITION FOR OPERATION	~~Before beginning a new batch, transfer, or process operation~~The Standby Power Diesel Generator shall be OPERABLE to ensure that the ventilation exhaust system will be supplied with the necessary backup power during a loss of normal sources of electrical power. To be considered OPERABLE, the Standby Power Diesel Generator shall be supported by an OPERABLE starting battery (SR 4.4.1.1), an OPERABLE fuel supply (SRs 4.4.1.3 and 4.4.1.4), and have successfully undergone a periodic startup and load test (SR 4.4.1.2).	

MODE APPLICABILITY	The Standby Power Diesel Generator is required to be OPERABLE during all MODES because radioactive materials are expected to be present within the Facility and the potential for a loss of normal power is credible.
ACTION STATEMENTS	A.1 If the Standby Power Diesel Generator is inoperable, Required Action A.1 requires the diesel generator to be restored to OPERABLE status within 8 Hours. The Completion Time of 8 Hours is based on the failure frequency of the loss of AC power to the Facility found in the DSA (Ref. 1).
	(Note: Continued on Next Page)

~~TSR 3/4.1-12 Rev. 0 9/13/01~~

Figure ~~16~~9b. Example of ~~Criticality Prevention TSR (continued).~~

~~Criticality Alarm~~

Diesel Generator LCO Bases (Page 1).

~~3/4.1 INSTRUMENTATION~~

~~3.1.7 CRITICALITY ALARMS~~

~~LCO:~~ ~~Two Criticality Alarm Channels shall be OPERABLE for each monitored area listed below, with administratively controlled alarm set points set to actuate audible and visual alarms in the monitored area and the control room.~~

~~MODE APPLICABILITY:~~ ~~OPERATION, STANDBY, and PARTIAL SHUTDOWN~~

~~PROCESS AREA APPLICABILITY:~~ ~~[Product Receiving Area]~~
~~[Recovery Room]~~
~~[Process Room]~~
~~[Recovery Room Mezzanine]~~

~~ACTIONS:~~

~~**CONDITION**~~	~~**REQUIRED ACTION**~~	~~**COMPLETION TIME**~~
~~A. One Criticality Alarm Channel in any monitored area is inoperable.~~	~~A.1 Restore inoperable channel to OPERABLE status.~~	~~24 Hours~~

~~B. The ACTION and associated completion time of Condition A are not met.~~SURVEILLANCE REQUIREMENTS	~~B~~SR 4.4.1~~ Place~~.1 The starting batteries on the ~~[ ]~~Standby Power Diesel Generator shall be checked at least Monthly to ensure that the batteries are charged and capable of starting the generator on demand. Inspections shall include verification of proper voltage, proper cell electrolyte level and specific gravity of all cells (Ref. 1). The surveillance frequency is based on the low consequences associated with a loss of power and upon established practices. SR 4.4.1.2 This SR demonstrates that the Standby Power Diesel Generator automatically starts from standby conditions and attains the required voltage and frequency within the specified time (15 seconds) in ~~PARTIAL SHUTDOWN.~~accordance with guidance provided in Reference 1. After achieving the required voltage and frequency, the diesel generator must supply at least 30% of the rated capacity for at least 30 minutes (Ref. 1). The surveillance frequency is based on the low consequences associated with a loss of power and upon established practices. ~~**AND**~~ ~~B.2 Restore inoperable channel to OPERABLE status.~~SR 4.4.1.3 The fuel oil level for the Standby Power Diesel Generator shall be checked within 24 Hours after each diesel engine shutdown to ensure that the fuel tank inventory is available to support [7] days of full load operation. The fuel oil inventory equivalent to a [7] day supply is [400] gallons and is based on a diesel consumption rate for the run time. SR 4.4.1.4 The diesel fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within the limits of the Diesel Fuel Oil Testing Program. Testing shall include [specific gravity, appearance, particulates, etc. in accordance with national standards].	~~1 Hour~~ ~~4 Hours~~

~~C. Two Criticality Alarm Channels in any monitored area are inoperable.~~REFERENCES	~~C.1 Place the [ ] in PARTIAL SHUTDOWN.~~ ~~AND~~ 1. ~~C.2 Restore at least one inoperable channel in OPERABLE status.~~Documented Safety Analysis – Facility.	~~1 Hour~~ ~~2 Hours~~
~~D. The ACTION(s) and associated completion times of Conditions B or C are not met.~~	~~D.1 Place the [ ] in FULL SHUTDOWN.~~	~~6 Hours~~

~~TSR 3/4.1-13 Rev. 0 9/13/01~~

Figure ~~17~~9b. Example of ~~Criticality Alarm TSR.~~Diesel Generator LCO Bases (Page 2).

~~Criticality Alarm SRs~~

~~**3/4.1 INSTRUMENTATION**~~

~~3.1.7 CRITICALITY ALARMS (continued)~~

~~**SURVEILLANCE REQUIREMENTS**~~

Standby Power Diesel Generator Example Discussion

A standby or emergency diesel generator is often included in the TSRs. This is so because such generators may be supplying emergency power in accident conditions. In such cases, the LCO is covering a support system. The credited safety system in this example is the ventilation system and the diesel provides the backup power upon loss of offsite power. The LCO itself is a simple “shall be operable” statement, coupled with a Bases statement containing the specifics of what “operable” means. The LCO describes the surveillances in a general way, with the details provided in the Bases. The concern with this particular type of organization is that the LCO is not stand alone, the bases must be referred to for a full understanding of the requirement which may hinder response under accident conditions, and that it is essential that the Bases provide the required information to ensure the operator can execute the proper control. Because this is a support system only, many of issues listed above are not as important as they might be for a critical system.

Due to this being a support system, the required action is also a simple return to service. While a return to service is an implied default action for any LCO, it is specified in this case to provide a proper time frame, based on the DSA analysis, for a return to service without invoking a TSR violation.

~~SURVEILLANCE REQUIREMENT~~5.0	~~FREQUENCY~~ADMINISTRATIVE CONTROLS
~~SR 4.1.7.1 ——— Perform a CHANNEL CHECK.~~5.1	~~Shiftly (each shift)~~Responsibility
~~NOTE Test includes actuation of both visual and audible alarms in the control room and the monitored area.~~	~~Semiannually~~The Facility Manager shall be responsible for overall safe operation of the FACILITY and shall have control over those activities necessary for safe operation of the FACILITY. The Facility Manager shall delegate, in writing, the succession to this responsibility during any absences.

~~SR 4.1.7.2~~

~~Perform a CHANNEL FUNCTIONAL TEST.~~

5.1.1

~~SR 4.1.7.3~~

~~Perform a CHANNEL CALIBRATION.~~ 5.1.2

~~Annually~~The Control Room Supervisor (CRS), or in their absence a designated, qualified individual, shall be responsible for the FACILITY command function. As part of this command function, the CRS shall ensure operation of the FACILITY is in accordance with approved TSRs.

5.2 Organization

5.2.1 Organization

Lines of authority, responsibility, and communication shall be defined and established for the highest management levels, through intermediate levels, down to and including all operating organization positions.

The individuals who train the operating staff, carry out radiological control, or perform Quality Assurance (QA) functions may report to the Facility Manager; however, they shall have sufficient organizational freedom to ensure their independence from operating pressures.

5.2.2 FACILITY Staff

The FACILITY staff organization shall be as follows:

A current list of FACILITY support personnel shall be maintained. This list should include management, radiation safety, and technical support personnel.

The minimum FACILITY shift crew composition shall be as shown in Table 5.2.2-1.

Administrative procedures shall be developed and implemented to limit the working hours of staff who perform safety-related functions (e.g., personnel required to meet the minimum shift crew composition).

(Note: Continued on Next Page)

Figure ~~17.~~ 10. Example of ~~Criticality Alarm TSR (continued).~~Administrative Controls (Page 1).

~~**3/4.1 CRITICALITY PREVENTION**~~

~~3.1.1 EVAPORATION LEVEL AND SPECIFIC GRAVITY INSTRUMENTATION~~

~~**LCO:** The evaporator LOW Level/Steam Flow Interlock shall be OPERABLE with a set point greater than or equal to XX.~~

~~**AND**~~

~~The evaporator High Specific Gravity/Steam Flow Interlock shall be OPERABLE with a set point less than or equal to YY.~~______________.

~~**MODE APPLICABILITY:** OPERATION~~

~~**PROCESS AREA APPLICABILITY:** Evaporators that handle fissile material.~~

~~**ACTIONS:**~~

~~**CONDITION**~~	~~**REQUIRED ACTION**~~Organization (continued)	~~**COMPLETION TIME**~~
5.2		

5.2.2 FACILITY Staff (continued)

Table 5.2.2-1 {FACILITY} Minimum Shift Crew Composition[1]

MODE	CRS	CRO	BOP	RC
OPERATION	1	3	3	1
STANDBY	1	2	3	1
MAINTENANCE	1	2	3	1

CRS Control Room Supervisor

CRO Control Room Operator

	BOP Balance of Plant Operator/Supervisor RC Radiological Control	
~~A. The Evaporator Low Level/ Steam Flow Interlock is inoperable. The FISSILE MATERIAL inventory limit for a glovebox is exceeded.~~	~~A.1 Stop the steam supply to the evaporator.~~ ~~**AND**~~ ~~A.2 Place the evaporator in STANDBY.~~[1] During a shift, to accommodate unexpected absences of on–duty shift crew members, the shift crew composition may be one less than the minimum requirements for not more than 2 Hours provided immediate action is taken to restore the shift crew composition to within the minimum requirements. This provision is not applicable at the time of shift turnover.	~~IMMEDIATELY~~ ~~8 Hours~~
5.3	Staff Qualifications and Training	
5.3.1	Qualification	
~~B. The Evaporator High Specifi~~	~~B.1 Stop the steam supply to the evaporator.~~ ~~**AND**~~ ~~B.2 Place the evaporator in STANDBY.~~A program shall be established to ensure that FACILITY staff who perform safety-related functions meet established qualification requirements for their positions. This program shall adhere to qualification requirements established in	~~IMMEDIATELY~~ ~~8 Hours~~

~~e Gravity/Steam Flow Interlock is inoperable.~~	accordance with applicable DOE regulations.

(Note: Continued on Next Page)

~~TSR~~ ~~3/4.1-15~~ ~~Rev. 0 9/13/01~~

Figure ~~18.~~ 10. Example of ~~Criticality Prevention TSR.~~Administrative Controls (Page 2).

~~3/4.1 CRITICALITY PREVENTION~~

~~3.1.1 EVAPORATOR LEVEL AND SPECIFIC GRAVITY INSTRUMENTATION (continued)~~

~~SURVEILLANCE REQUIREMENTS~~

~~SURVEILLANCE REQUIREMENT~~		~~FREQUENCY~~
~~SR 3.3.1.1~~	~~Perform a FUNCTIONAL TEST on each~~	~~Semiannually~~

~~evaporator Low Level/Steam Flow Interlock.~~	
~~SR 3.3.1.2 Perform a FUNCTIONAL TEST on each evaporator High Specific Gravity/Steam Flow Interlock.~~5.3.2	~~Semiannually~~Training
	An initial training and retraining program for the FACILITY staff shall be established and maintained. This program shall adhere to training requirements established in accordance with applicable DOE regulations.
~~SR 3.3.1.1 Perform a CALIBRATION on each evaporator Low Level/Steam Flow Interlock.~~5.3.3	~~**Annually**~~Violation of TSR VIOLATIONS of the TSR occur as the result of the following: 1. Exceeding an SL. 2. Failure to complete a REQUIRED ACTION within the COMPLETION TIME following: • Exceedance of an LCS, and • Failing to comply with an LCO 3. Failure to perform a surveillance requirement within the required time limit. 4. Failure to comply with an AC. There are two different types of ADMINISTRATIVE CONTROL VIOLATIONS; • The first is the failure to comply with a SPECIFIC ADMINISTRATIVE CONTROL requirement in a directive action SAC. A single failure to comply constitutes a TSR VIOLATION. • The second type of AC VIOLATION is when the intent of a program included in the ADMINISTRATIVE CONTROLS is not fulfilled. The AC can be directly violated, for example, by not implementing the AC at all. A single non-compliance would not necessarily constitute a TSR VIOLATION. To qualify as a TSR

	VIOLATION, the failure to meet the intent of the referenced program would need to be significant enough to render the DSA summary invalid.
~~**SR 3.3.1.2 Perform a CALIBRATION on each evaporator High Specific Gravity/Steam Flow Interlock.**~~ ***(Note: Continued on Next Page)***	~~Annually~~

Figure ~~18.~~ 10. Example of ~~Criticality Prevention TSR (continued~~ Administrative Controls (Page 3).

~~Confinement System Ventilation System~~
~~LCO~~

~~3/4.2 CONFINEMENT SYSTEM~~

~~3.2.1 CONFINEMENT VENTILATION SYSTEM~~

~~**LCO:** A. Two Confinement Ventilation Systems shall be OPERABLE with each system having the following components:~~

- ~~One supply fan~~
- ~~Two exhaust fans~~
- ~~One supply-line charcoal filter~~
- ~~One supply-line HEPA filter~~
- ~~Two exhaust-line HEPA filters~~
- ~~Exhaust flow instrumentation:~~
  - ~~One exhaust flow indicator, with alarm~~
  - ~~One beta-gamma radiation monitor, with alarm~~
  - ~~One gas temperature sensor downstream of the filter~~

~~B. One Confinement Ventilation System shall be in operation.~~

~~**MODE APPLICABILITY:** OPERATION, STANDBY, and PARTIAL SHUTDOWN~~

~~**PROCESS AREA APPLICABILITY:** [process area(s)]~~

~~**ACTIONS:**~~

5.7	~~**CONDITION**~~Procedures, Programs, and Manuals	~~**REQUIRED ACTION**~~	~~**COMPLETION TIME**~~
5.7.2	Programs and Manuals The following programs shall be established, implemented, and maintained.		
5.7.2.1	~~A. One Confinement Ventilation System train is inoperable.~~ Radiation Protection Program	~~A.1 Restore Confinement Ventilation System train to OPERABLE status.~~	~~72 Hours~~

~~B. The ACTION and associated Completion Time of Condition A are not met.~~The radiation protection program shall ensure that the radiation exposure of onsite and offsite individuals is maintained within applicable DOE limits and is As Low As Reasonably Achievable (ALARA). The program shall ensure that individual and collective radiation exposures are minimized. Procedures for personnel radiological protection shall be prepared consistent with DOE requirements and shall be approved, maintained, and adhered to for all operations involving personnel radiation exposure.	~~B.1 Place the [processs area(s)] in FULL SHUTDOWN.~~	~~6 Hours~~

5.7.2.2 FACILITY Fire Protection Program

~~C. Both Confinement Ventilation Systems trains are inoperable~~A FACILITY fire protection program shall be established to minimize the following:	~~C.1 Place the [process area(s)] in PARTIAL SHUTDOWN.~~ ~~AND~~ ~~C.2 Restore one system to OPERABLE status.~~	~~1 Hour~~ ~~2 Hours~~

- Threats to the public health or welfare resulting from a fire
- Undue hazards to site personnel from a fire

The fire protection program shall include the following key elements:

Fire Prevention

- Fire-resistive construction
- Control of combustibles
- Control of ignition sources
- FACILITY inspections
- Handling of combustible or flammable liquids and gases
- Fire Protection impairment control and compensatory action process

Fire Control

- Automatic detection/suppression and alarm systems
- Fire Watches/Patrols (as necessary)
- Proper availability and maintenance of FACILITY firefighting equipment
- Identification of firefighting personnel, responsibilities, and training
- Fire barriers (as required by the DSA)
- 24-hour firefighting coverage

(Note: Continued on Next Page)

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Figure ~~19.~~ 10. Example of ~~Confinement Ventilation System LCO.~~

Administrative Controls (Page 4).

~~Confinement System Ventilation System SRs~~

~~3/4.2 CONFINEMENT SYSTEM~~

~~3.2.1 CONFINEMENT VENTILATION SYSTEM~~

~~SURVEILLANCE REQUIREMENTS~~ *~~Sheet 1 of 2~~*

~~SURVEILLANCE REQUIREMENT~~5.7.2.5	**~~FREQUENCY~~**Configuration Management Program
~~SR 4.2.1.1~~ ~~Verify that each Confinement Ventilation System train in operation is taking suction on the~~	~~8 Hours~~A Configuration Management Program shall be established, implemented, and maintained that:

~~confinement zone at a rate of [ ] scfm or more.~~		
~~SR 4.2.1.2~~ ~~Verify that the Confinement Ventilation System train in standby is aligned to take suction on the confinement zone and that the fan control is in "AUTO" position.~~	• ~~8 Hours~~Identifies and documents the technical baseline of Structures, Systems, Components and computer software; • Ensures that changes to the technical baseline are properly developed, assessed, approved, issued, and implemented; • Maintains a system for recording, controlling, and indicating the status of technical baseline documentation on a current basis; and • Controls the configuration of the SSCs specified in the Design Features section of this TSR.	
~~SR 4.2.1.3~~	~~Operate each Confinement Ventilation System train for [≥ 10 hours continuous with the heaters operating or (for systems without heaters) ≥ 15 minutes].~~	~~Monthly~~
~~SR 4.2.1.4~~	~~Perform the following on each confinement exhaust flow indicator and alarm.~~ • ~~CHANNEL CHECK~~ • ~~CHANNEL FUNCTIONAL TEST~~ • ~~CHANNEL CALIBRATION~~	 ~~Daily~~ ~~Quarterly~~ ~~Annually~~

~~SR 4.2.1.5~~	~~Perform the following on each exhaust flow beta-gamma radiation monitor and alarm.~~ • ~~CHANNEL CHECK~~ • ~~CHANNEL FUNCTIONAL TEST~~ • ~~CHANNEL CALIBRATION~~	 ~~Daily~~ ~~Quarterly~~ ~~Annually~~
~~SR 4.2.1.6~~	~~Perform the following on each exhaust flow gas temperature sensor.~~ • ~~CHANNEL CHECK~~ • ~~CHANNEL FUNCTIONAL TEST~~ • ~~CHANNEL CALIBRATION~~	 ~~Daily~~ ~~Quarterly~~ ~~Annually~~

~~TSR 3/4.2-18 Rev. 0 9/13/01~~

Figure ~~20.~~ 10. Example of ~~Confinement Ventilation System Surveillance Requirements.~~Administrative Controls (Page 5).

~~Confinement System Ventilation System SRs~~

~~**3/4.2 CONFINEMENT SYSTEM**~~

~~3.2.1 CONFINEMENT VENTILATION SYSTEM (continued)~~

~~**SURVEILLANCE REQUIREMENTS (continued)**~~ ~~*Sheet 2 of 2*~~

Administrative Controls Example Discussion

Section 5.0 is typically the section reserved for administrative controls in the TSRs. This section contains various types of administrative contents which appear under major headings. These normally include purpose, organization & management, technical safety requirements, procedures, review & audit, and facility operating records. These sections generally contain high-level descriptions of the important aspect of these topics, as provided in the example of the organization and management section in this example. The definition of a TSR violation shown would normally appear under the TSR section and might also include subjects such as operations outside the TSR and the TSR review and approval process. The final two sections of the administrative control section would typically be the safety management program section and a specific administrative control section. The safety management program section contains short descriptions of assumed programs usually followed by a bulleted list of any specific elements of those programs that were identified in the DSA. The specific administrative control section would then identify any SACs that were specified in the DSA. It is strongly recommended that SACs be placed in a separate section to provide easier accessibility for operations staff.

It is important to note that this section is intended to be a high-level description of the aspects of administrative controls necessary to ensure that the facility is operated within the safety basis, and not a comprehensive description of controls or programs that are implemented in this facility. This example was a short selection of typical content and not intended to indicate an entire administrative control section as that would normally run several pages long. Besides the organization and management section, other general examples were provided in no particular order to give some commonly found information that might appear in the administrative controls and to indicate the level of detail and form that might typically be encountered.

~~SURVEILLANCE REQUIREMENT~~	~~FREQUENCY~~

~~SR 4.2.1.7 For each Confinement Ventilation System train, verify that the filter cleanup system satisfies the in-place penetration and bypass leakage testing acceptance criteria of < [*]% and uses test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, and verify that the system flow rate is [ ] cfm ± 10%.~~ **SAC Example**

~~18 Months~~

~~**OR**~~

~~After any structural maintenance on the HEPA filter or charcoal absorber housings~~

~~**OR**~~

~~Following painting, fire, or chemical release in any ventilation zone communicating with the system~~

***(NOTE:** This is the directive action SAC that is mentioned in the previous Drum LCOs)*

5.7.3 OVERPACKING TRU WASTE Drums with MAR ≥ X00 PE-Ci located in RETRIEVAL AREAS

Safety Function: The safety function is to reduce radiological consequences by limiting the amount of MAR affected by thermal or mechanical insults.

Control Description: TRU WASTE Drums ≥ X00 PE-Ci retrieved from Trenches SHALL be OVERPACKED prior to retrieval of an additional TRU WASTE drum in the DEFINED AREA.

***Basis:** Many drums that are currently stored in Trenches are known to contain greater than X00 PE-Ci. These drums are not currently OVERPACKED as required by LCO 3.1.7 for above-ground containers, and cannot be OVERPACKED until they have been removed from the trench. Upon removal from an uncovered culvert, any drum with ≥ X00 PE-Ci is OVERPACKED before another drum is retrieved. Depending on the integrity of a retrieved drum with ≥ X00 PE-Ci, OVERPACKING may require the retrieved drum to be OVERPACKED with a single TRU WASTE container (if the retrieved drum itself is of sound integrity) or with two TRU WASTE successive containers (if the retrieved drum is not of sound integrity)*

Metal TRU WASTE containers with higher PE-Ci values that are OVERPACKED provide a mitigative function by reducing the MAR involved in the event. This control addresses fire, deflagration, loss of confinement, external, and NPH events. Based upon the types of activities that may be conducted within an area (e.g., storage or processing) it was determined that limiting the quantity of radiological material that may be involved in any one process upset is an effective means for controlling the risk. With high MAR containers being OVERPACKED, the material available for release is limited and, therefore, reduces the consequences to the public, collocated workers, and facility workers.

~~TSR~~ ~~3/4.2-19~~ ~~Rev. 0 9/13/01~~

Figure ~~20~~11. Example of Overpack Directive Action SAC.

Drum Overpack SAC Example Discussion

This particular SAC deals with retrieval of waste drums from a trench. This control protects DSA assumptions about the maximum MAR exposed to an accident condition. As stated in the text, this SAC is connected to an LCO that deals with drum PE-Ci values and overpacking. This relationship demonstrates how the same SAC may be addressed in both directive action and LCO formats.

The relevant LCO provides rules for overpacking and storing any single drum that exceeds ≥ X00 PE-Ci. This SAC requires that no additional drum be retrieved until the high-MAR drum is overpacked. This control is split into two different types of LCO because of the difference in importance to safety. One exposed drum does not create a condition outside the analysis and is an anticipated possibility therefore it is appropriate to have an LCO that provides the proper required actions and times for responding to this condition. However, uncovering more than one drum that violates this condition is beyond the analysis, therefore this SAC is provided separately to ensure that any further uncovering of drums before overpacking is a TSR violation.

If this control were associated with the complimentary LCO, it would allow a condition where more drums could be uncovered before the drum of concern was overpacked.

This is an important point for a TSR writer to consider. Any directive action SAC non-compliance is an instant TSR violation, therefore it is important to ensure that any directive action SAC be important enough to safety that any non-compliance warrants a TSR violation.

No specific format is required for a directive action SAC; the one provided here is for example purposes only.

Providing information on the safety function of the control, while not required, can be very beneficial to the operator. Since directive action SACs do not contain required actions, this additional information can aid the operator in making the appropriate responses to a failure to meet a SAC statement.

DF Example

6.1.3 Type B Containers

Type B containers are robust, transportation containers designed to withstand accident conditions without releasing radioactive material. The containers' specific performance criteria are documented in a *Safety Analysis Report for Packaging.*

Applicability: Type B containers are required to meet their performance criteria when they are sealed, with radioactive waste inside.

IN-SERVICE INSPECTIONS	FREQUENCY
VERIFY that Type B containers have a current inspection sticker or documentation of compliance provided by the manufacturer.	Prior to the loading of MAR into a Type B container

Basis:

The accident analysis assumes a Radiological Inventory Control that specifies the radioactive waste material limits and administratively monitors the amount of radiological inventory within each area to ensure that its limit is not exceeded. This control is credited for fire, explosion, loss of confinement/containment, external, and NPH events. As allowed by DOE-STD-1027, radioactive waste in a sealed Type B container is not included in the radiological inventory. These containers, properly assembled, ensure that their contents are not MAR for postulated accidents.

Because Type B containers are either government-supplied equipment (e.g., TRUPACT II or HalfPACT) or commercially supplied equipment (e.g., Model 10-160B), the verification of the performance criteria for these containers is the responsibility of another entity. Ensuring that the containers have a current inspection sticker (or comparable documentation) provides evidence that the containers meet the conditions of their current Certificate of Compliance and their Safety Analysis Report for Packaging, and will perform their safety function as intended.

Figure 12. Example of Type B Container DF.

Type B Container Design Feature Example Discussion

This is an example of a design feature (DF) for a type B container that is being used to exclude MAR from the analyzed accident. This DF protects the assumption that the type B containers used are qualified in accordance with the analysis. The format provided here is an example only, though the DF specification and associated ISI are typically specified. Since DFs do not contain required actions, additional information can aid the operator in making the appropriate responses to a failure to meet design specifications or failure to perform an ISI.

Appendix C: Independent Implementation Verification Reviews (IVRs)

1. PURPOSE

This appendix describes suggested approaches for performing independent implementation verification reviews of all controls designed to implement the Safety Basis. Such controls include TSRs and their associated DSA assumptions and commitments.

The purpose of an IVR is to independently confirm the proper implementation of new or revised safety basis controls. Independence of the review adds an additional layer of defense in depth and is a common practice standard in the commercial nuclear power industry. IVRs support meeting the 10 C.F.R. §830.201 requirement for operating contractors for Hazard Category 1, 2, or 3 nuclear facilities to "perform work in accordance with the facility safety basis" and quality assurance (QA) requirements found in 10 C.F.R. Part 830, Subpart A. Special emphasis is placed on 10 C.F.R. §830.122(j), Criterion 10, which mandates "independent assessments to measure item and service quality, to measure the adequacy of work performance, and to promote improvement."

2. APPLICABILITY AND SCOPE OF APPENDIX

This appendix is intended for use by DOE and DOE contractor organizations responsible for Hazard Category 1, 2 and 3 nuclear facilities. It applies to hazard controls identified in TSRs and their associated DSA assumptions and commitments. This appendix is focused on IVRs performed by operating contractors, but also provides guidance for DOE's oversight of IVRs. The scope of this appendix includes initial verification of safety basis controls for new DSAs and DSA revisions (both major and minor) as well as periodic review of the continued effective implementation of safety basis controls.

The appendix is limited to independent verification of the implementation of safety basis hazard controls. It does not address the review of the safety basis documentation itself. Guidance for review of such documentation can be found in DOE Guide 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 C.F.R. 830.*

3. WHEN TO CONDUCT AN IVR

3.1. Initial IVRs

The initial contractor IVR should follow the initial implementation of the new safety basis. The IVR should be completed prior to the contractor declaring readiness to commence operation under the new controls. The IVR may be a prerequisite to a Readiness Review required in accordance with DOE Order 425.1D, *Verification of Readiness to Startup or Restart Nuclear Facilities.* The IVR should not be part of, or a substitute for any part of, a required Readiness Review.

Prior to commencing the IVR, contractor line management should ensure that the safety basis has been fully implemented. This means that safety basis controls are implemented to the point that independent verification of their efficacy is practical. The following are attributes of a fully implemented safety basis:

- All requirements, assumptions, and commitments in the TSRs and DSA have been identified and implementing controls have been developed.
- Safety basis controls have been incorporated into implementing procedures and work control documents.
- Implementing procedures are executable as written.
- Document configuration control procedures are fully developed and implemented such that any changes to implementing procedures will receive an appropriate USQ review.
- A DOE-approved Unreviewed Safety Question procedure has been implemented.
- Operators and facility personnel are trained and knowledgeable on the new controls and their relationship to the safety basis.
- Required surveillance activities and inspections are complete.
- Surveillances correctly test or verify assumptions and requirements of the safety basis.
- Physical changes associated with the safety basis change have been made and tested under a rigorous startup test process to verify operability in accordance with the design basis.
- Configuration items have been updated to reflect safety basis changes, (e.g. drawings, design documents, software).
- Labeling of components identified in updated safety systems has been completed.
- Inventory control procedures have been evaluated for consistency with the new safety basis.
- Process instruments, tools, and measuring and test equipment have been calibrated and tested.

Contractors often create and utilize a flow down matrix to support proper implementation of safety basis controls. An example of such a matrix appears below:

TSR Requirement	Implementing Procedure or Policy
5.7.1 Restricted Public Access to Transfer Route **SAC:** Public vehicular access to the transfer route SHALL be restricted.	P&T-WI-003, Trip Commander Instructions
5.7.2 Combustible Material Limits **SAC:** The transfer vehicle cargo storage area SHALL be inspected and combustible materials that do not support normal ongoing transfer operations SHALL be removed prior to transfer**.**	P&T-WI-002, Driver Instructions

3.2 IVRs Following Safety Basis Changes

Following a safety basis change, an IVR should be performed and any pre-implementation findings closed prior to commencing operation under the revised safety basis.

The breadth of the IVR should encompass the entire safety basis change, which means that all safety basis controls that have been created or changed should be verified as fully implemented. However, the depth and level of detail and the degree of formality of the review can be graded as follows:

- "Major" Changes – Multiple changes, physical alterations of credited components, or changes in methods used to demonstrate operability of TSR hazard controls. Major changes are those that could potentially affect the ability to comply with the safety basis.
- "Moderate" Changes – Safety basis changes that may warrant review prior to use. Moderate changes are more complex than editorial changes and may involve changes in multiple acceptance criteria for safety class or safety significant items.
- "Minor" Changes – Editorial changes. If there is no impact on TSR controls, an IVR is not required.

For major changes, the IVR should utilize formal tools such as a review plan and a criteria and review approach document (CRAD) (see Form 2 below for an example of a CRAD). For moderate changes, review plans and CRADs may not be needed—a simple checklist may suffice—or they may be graded in the depth of the review. For minor changes, an IVR plan is likely not needed; a simple checklist (see Form 3 below) may suffice.

The scope of DOE oversight of the IVR, if performed, can be determined based upon these same factors as well as considering past performance/effectiveness of contractor IVRs.

3.3 IVRs to Re-verify Control Implementation

The reverification of safety basis controls is an important tool for contractors to ensure that they remain in compliance with the safety basis. Contractors should develop and maintain a schedule of periodic IVR reverification activities as part of their ongoing assessment process. In general, reverification of safety basis controls should be performed every three to five years as part of the contractor's ongoing assessment process. Safety basis controls that are susceptible to the effects of the degradation of human knowledge (e.g., procedural controls) typically should be re-verified at least every 3 years, and controls dependent upon hardware functionality typically should be re-verified at least every 5 years.

The following factors should be considered in determining the specific frequency, scope, and depth of reverification of a safety basis control:

- Safety significance of the control;
- Type of control and susceptibility to deterioration; and,
- Extent of control changes that have accumulated since the last IVR

The basis for the periodicity of IVRs should be described and documented in individual site implementing procedures. ~~**Confinement Ventilation System**~~

The overall effectiveness of safety management programs referenced in TSRs (such as criticality safety and conduct of operations) is normally ensured by specific assessments already required for each of those programs.

Reverification of a facility's safety basis controls can be planned in a number of different, equally acceptable ways. A single review might be conducted by a relatively large team that re-verifies all the facility's controls in one review. Another option would be phased reviews, with a fraction of the controls being reviewed each year. However, if periodic SMP program assessments are not conducted, or if adverse trends in program performance are observed, the IVR reverification process can be used to examine these controls as well.

The benefit of the periodic, full-scope team review is that it ensures all safety basis controls will be reviewed in an integrated fashion. The disadvantage of this approach is cost in terms of human resources and dollars. A phased approach, depending on how it is structured, might not be as effective in identifying cross-cutting issues, but it can be more easily integrated into the facility's existing assessments and hence may be more cost effective. An example of a phased approach is provided below:

Facility: Typical Nuclear Facility		
TSR Control	**Description**	**FY**
AC 5.6.8	Hazardous Material Program	13
AC 7.7.3	Hot Inlet System Controls	13
LCO/SR 3/4.8	Halon Suppression System	14
LCO/SR 3/4.5	Uninterruptable Power Supply	14
LCO/SR 3/4.4	Tritium Monitoring System	14
LCO/SR 3/4.9	Tritium Gas Handling System	14
LCO/SR 3/4.2	Wet Pipe Sprinkler System	14
DF 6.2.2	Tritium Containment Vessels	14

DOE may also perform periodic reverification of safety basis controls. DOE's review can be performed as part of normal oversight and may not be as formal or detailed as the contractor's reverification assessment. What approach DOE takes should be determined as part of the integrated oversight planning.

4. IVR PLANNING AND PERFORMANCE

As discussed previously, for major, or in some cases moderate, changes in the safety basis, a formal IVR plan should be developed. A formal IVR plan is also useful for performing reverification of safety basis controls. The IVR plan should cover (a) scope of the review, (b) staff to be made available, (c) methods to be employed, and (d) schedule. The IVR for a new or major change of a safety basis should include all applicable attributes listed in Section 3.1 above.

IVR plans should be approved by responsible line manager designated in the site's implementing procedures for the IVR process. Form 1 provides an example outline of an IVR plan.

The contractor IVR plan should be consistent with normal site practices for developing review plans and should be an element of an overall contractor assurance system. If a phased approach is utilized for performing reverification, a plan that covers the complete reverification and which specifies items to be reviewed, the method of review, and schedule for each phase of the review should be developed.

Forms 2, 3, 4, and 5 are examples of the types of CRADS, Lines of Inquiry, or checklists that may be applicable for the particular IVR. The level of detail and the specificity of the enclosures will depend on the complexity of the IVR, whether it is a reverification or a new safety basis and to some extent, depend on the experience and independence of the IVR team. In most situations, the review plan forms will determine the adequacy and accuracy of the IVR. The team leader must provide technical expertise and leadership to ensure the review plan is adequately comprehensive and explicit to achieve the necessary results of the IVR.

4.1 Selection of an IVR Team Leader and Support Staff

The IVR team leader (or individual assessors) should have sufficient authority and freedom from line management responsible for the safety basis controls to be evaluated. Assessors should not have been involved in writing or implementing the controls to be verified.

IVR support staff should be experienced in the technical area being reviewed. The size and makeup of the contractor team will depend upon the scope, and depth, and level of detail of the review. Members should not review work in which they were involved

The IVR team makeup should be determined based on a graded approach that considers the scope and complexity of the safety basis changes. Good candidates for the IVR team include: personnel with team leader experience and operational readiness review experience, System Engineers, senior operations and maintenance personnel from other similar facilities, and other subject matter experts.

Not all IVRs will require the formation of teams. An IVR focused on a single technical area can be performed by a qualified individual not involved previously in the controls to be assessed.

4.2 Methods for Performing IVRs

4.2.1 Review of Design Features and Safety Systems

Implementation verification of design features and safety systems should include a review of documentation and a walkdown. The walkdown is intended to verify that certain design features and safety systems are in place and installed in accordance with approved design drawings. For safety-class and safety-significant items, the review should verify that procurement, construction and testing were guided by an appropriate level of quality assurance. Particular attention should be paid to any installed "temporary modification." Implementation verification of safety systems may also include a review of startup testing. The extent of the review should be predicated on the complexity and importance of the design feature or safety system. In the case of a reverification which includes physical changes, the IVR team should verify that the changes were designed and implemented in accordance with procedures and policies.

4.2.2 Review of Procedures

Maintenance, Inspection and Testing, and Surveillance Procedures. These procedures should be reviewed to ensure: (a) that they include limits, precautions, prerequisite conditions, applicable TSRs, acceptance criteria, required data to be recorded, and personnel qualifications, and (b) to determine whether they require the recording and timely notification of facility management of any discrepancies or unexpected conditions. (Typically sites will utilize a checklist to support their review of TSR surveillances.) The review of surveillances should include an evaluation of the mechanism (such as a schedule) used to ensure they are conducted when required, and whether they are consistently being performed on time. An example of a TSR surveillance checklist is provided in Form 4.

Depending upon the level of depth of review, the IVR of a procedure can include (a) a walkdown of the procedure accompanied by responsible facility personnel, (b) observation of the procedure being performed, or (c) a review of procedure execution records. During a verification following physical changes, the IVR team should verify that the change was flowed into implementing documents (e.g., procedures). Drawings and configuration control documentation should be reviewed for accuracy and completion.

Specific Administrative Controls. The IVR should include review of written implementing procedures and either observation of execution of the procedure or a walkdown with contractor personnel responsible for executing the procedures. Form 5 provides some additional criteria to support this verification.

4.2.3 Training Programs and Personnel Level of Knowledge

Operators, maintenance personnel, technicians and engineers that implement and maintain safety basis controls need to be properly trained and qualified. The IVR should evaluate the training of these individuals on (a) the need for and functions of the controls, (b) ability to verify that the controls are reliable, and (c) knowledge of how to perform any required safety functions in relation to those controls. The level of knowledge can be assessed using direct questioning and hypothetical cases.

Finally, the IVR should include a review of documentation showing that a systematic approach to training has been used in accordance with DOE O 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements* ~~**(continued).**~~ *for DOE Nuclear Facilities*.

4.3 Documentation of Results

The results of the IVR should be documented in accordance with normal site procedures for documentation of safety-related assessments and, identification of issues requiring corrective actions.

The forms provided below are examples for planning, conduct and documenting the results of the IVR. They can be shortened or expanded as necessary. To ensure consistency of IVRs, documentation forms should be included in site-specific implementing procedures.

Form 1 (Page 1)

Independent Implementation Verification Review Plan

The following is a example template for Independent Implementation Verification Review (IVR) Plans employing Criteria Review and Approach Documents (CRADs) and Lines of Inquiry (LOIs). This level of detail is appropriate for an initial safety basis implementation or major safety basis change. The site implementing procedures for the IVR process should include procedures for designation of the team leader, assignment of team members, approval of the review plan, and management of the final report.

INTRODUCTION/BACKGROUND

Provides background information concerning the new or modified safety basis document, new hazards, and issues associated with the safety basis implementation to be reviewed.

SCOPE OF THE REVIEW

Identifies the safety basis controls whose implementation will be verified including the breadth and depth of the review.

- Facility/Systems/Equipment/Components
- Personnel
- Implementing Procedures

IVR PREPARATIONS

Identifies individuals or team members and describes any preparations, including pre-review activities, document reviews, and development of CRADs that will be undertaken prior to the formal start of the IVR. A discussion of training considerations for reviewers should appear here.

- Review Team Selection and Assignments
- Review Team Preparations
- Review Team Training

IVR REVIEW PROCESS

Describes the review approach including use of checklists or a Criteria Review and Approach Document (CRAD), team meetings, and daily reporting expectations.

Describes the mechanism for the IVR-related meetings, correspondence, communications, team structure, etc., of the review. The team composition/organization, interface requirements, any oversight groups, and DOE organizations to be involved in the review should be discussed in this section.

~~**B3/4.5.10 PRESSURIZER SAFETY VALVES**~~

~~B3/4.5 PRESSURE LIMITS~~

~~**BASES:**~~

~~LCOs: LCOs 3/4.5.1 through 3/4.5.9 establish the general requirements for pressure control.~~

~~LCO 3/4.5.1~~

~~a. Background~~

~~b. Applicable Safety Analysis~~

~~LCO 3/4.5.1 establishes the limiting conditions for operation for the Pressurizer Safety Valves (PSV) based on the relief capacity requirements identified in Section 11.x.yy of~~**Form 1 (Page 2)**

REPORTING AND RESOLUTIONS

Details the ~~DSA. The single failure criterion requires~~methods that ~~2 PSVs be **OPERABLE** for operation and start-up modes.~~

~~c. Safety and Operating Limits~~

~~d. ACTION Statements~~

~~e. Surveillance Requirements~~

~~f. References~~

~~LCO 3/4.5.2 establishes~~ the ~~limiting condition for. . .~~

~~HFR TSR B3/4.5-12 Rev. 0 9/13/01~~

~~**Figure 21. Example of Bases Appendix.**~~

~~2 TECHNICAL SAFETY REQUIREMENTS WRITER'S GUIDE~~

~~A.1 Introduction~~

~~Style in writing is the cumulative effect of the writer's choice of words and phrases, sentence structure, emphasis, and arrangement of material. In any technical writing, the style should not intrude on the communication of facts. Good technical writing style is not apparent until it falters. Inconsistent or inappropriate wording, sentence structure, or punctuation distracts the user and distorts meaning. This section contains style guidelines for writing Technical Safety Requirements (TSRs). They apply to all sections of the requirements. Their consistent use~~ team will ~~ensure the information in TSRs is as clear, concise, and usable as possible.~~

~~A.2. Words and Phrases~~

~~A.2.1 Use Familiar Words~~

~~Brief, clear writing increases reading speed and comprehension. To make writing readable and understandable, use familiar words. Such words tend~~ use to ~~be short and used often in conversation. There is rarely any meaning gained by using a longer, less familiar word.~~

~~Less familiar~~	~~Familiar~~
~~approximately~~	~~about~~
~~utilize, employ~~	~~use~~
~~accumulation~~	~~buildup~~
~~prior to~~	~~before~~
~~however~~	~~but~~
~~proceed~~	~~go on, go~~
~~facilitate~~	~~help, ease~~
~~additionally~~	~~too, also~~

~~A.2.2 Use Words With Precise Meanings~~

~~Words and phrases such as the following do not have precise meaning for the user and should be avoided:~~

- ~~approximately,~~
- ~~as soon as possible, and~~
- ~~initiate at once.~~

~~When a word or phrase is to be used as the basis for a compliance requirement, be precise. Do not use words that cannot be precisely interpreted.~~

~~A.2.3 Verbs~~

~~Use the standards in the following paragraphs as guidelines for the correct use of verbs and verb forms.~~

- ~~Strong Versus Weak Verbs. Do not smother strong verbs by turning them into objects of weaker verbs.~~

~~Weak~~	~~Strong~~
~~make an inspection~~	~~inspect~~
~~perform a verification~~	~~verify~~
~~take the measurement~~	~~measure~~

- ~~Short Versus Long Verbs. Use one-syllable verbs instead of two-syllable verbs. Use one-and two-syllable verbs instead of verbs with several syllables. Unless technical meaning demands the longer verb, there is no good reason to use it.~~

~~Long~~	~~Short~~
~~function~~	~~work~~
~~accomplished~~	~~done~~
~~accumulate~~	~~build up~~
~~perform~~	~~do, make, take, run~~
~~prevent . . . from~~	~~keep . . . from~~
~~fabricated~~	~~made~~

~~A.2.4 Articles~~

~~Articles are "a," "an," and "the." Use articles in descriptive text only as needed for clarity and flow of thought. Do not use articles in the following.~~

- ~~Titles of documents, chapters, sections, paragraphs, figures, tables, appendices, or other document~~ report IVR results. These elements~~.~~

- ~~Table column headings.~~

- ~~Table entries and tabular instructions unless a passage cannot be clearly understood without articles.~~

- ~~Procedural steps and instructions. Keep procedural information direct and concise by omitting articles unless a passage cannot be clearly understood without them.~~

~~A.3 Sentence Structure~~

~~A.3.1 General Rules~~

- ~~Arrange words in sentences and sentences in paragraphs so that the meaning is clear on first reading.~~

- ~~Make sentences concise by omitting useless words.~~

- ~~Rewrite sentences that may be confusing, awkward, illogical, or obscure to the reader.~~

- ~~Break up long, straggling, complex sentences into two or more short ones.~~

- ~~Do not~~ include ~~words, phrases, or clauses that do not relate directly to the main thought of the sentence.~~

~~A.3.2 Sentence Length~~

~~Short sentences and clauses make writing more readable and understandable. Not all long sentences are hard to understand, but length and difficulty tend to be related. Sentence length can be varied to avoid monotony; however, examine long sentences to see whether they can be shortened. Change long sentences to shorter ones by changing clauses to phrases, clauses or phrases to single adjectives or adverbs, and long phrases to shorter ones. These techniques are demonstrated in the following examples.~~

- ~~Long: During the performance of an ANALOG CHANNEL OPERATIONAL TEST, it is necessary to check the entire instrumentation loop (excluding sensor)~~documentation of the results, including ~~the function of an annunciator light; however, during performance of a CHANNEL CALIBRATION, it is not necessary to ensure that all annunciators function properly.~~ good practices, findings, and observations, lessons learned from the review, and the final report.

SCHEDULE

A discussion of the proposed schedule for conduct of the review, report preparation, and closeout.

APPROVALS

Plan development should be monitored by the IVR Team Leader. The plan should be approved as specified in the site's procedures.

APPENDICES

Include reporting forms, CRADs, Lines of Inquiry (LOI), Lessons Learned from previous IVRs, resumes, or summary of team members' relevant experience, and other sections appropriate to stand alone in an appendix.

Form 2 (Page 1)

Example: Criteria Review and Approach Document (CRAD) to Support IVRs

The following are example CRADs. The CRADs used for IVRs need to be tailored to the safety basis controls being verified. Some review approaches will be based on document review, while others will be performed by interviews or physical inspections.

Objective 1: ***Verify that the safety basis controls and requirements are incorporated in appropriate facility documents and work instructions.***

Criteria:

1.1 Administrative Controls, implementing processes, and supporting surveillance requirements are adequately documented in reviewed and approved work instructions.

Review Approach

- Are controlled, accurate, and current copies of the TSR available where needed?

- Are there adequate and correct work instructions for implementing the Surveillance Requirements associated with Administrative Controls? Are accurate data sheets provided?

- Describe the documented work processes used to control waste crate and container handling within the building. What control prevents the storage of waste drums and crates outside the facility? Does the safety basis allow storage of low-level waste (LLW) crates outside the facility and what process is used to manage the configuration and locations of LLW crates stored outside the building?

- How are limits established, implemented, and maintained for required sizing and spacing between each combustible package and other items of concern?

- Approval has been given to store combustibles for up to 15 minutes in specific corridors without meeting spacing requirements. What process controls this condition and how is the time material is stored recorded? What control prevents exceeding the allowed time?

- How is the storage of combustibles controlled to ensure that they are not stored in prohibited areas of the facility? What control or barrier exists that prevents the introduction of combustible material into the facility? Has a “Combustion-Free” zone been established in the facility?

- What barrier or control ensures that combustible loading in a glovebox does not exceed applicable limits?

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1.2 Limiting Conditions for Operations (LCOs) and supporting Surveillance Requirements and acceptance criteria are adequately documented in reviewed and approved work instructions that are consistent with the facility safety basis and applicable Safety Evaluation Reports (SERs).

Review Approach

- Are adequate and correct work instructions implementing the Surveillance Requirements prepared, reviewed, and approved? How is the configuration of these documents controlled and maintained?

- Do work instructions for Surveillance Requirements describe the limitations beyond which an Out-of-Tolerance condition would exist? How are limitations defined for Planned Out-of-Tolerances?

- Are the acceptance criteria for Surveillance Requirements documented in appropriate work instructions? Are they consistent with the corresponding Safety Evaluation Report? How has consistency been verified?

- Are Violations, Out-of-Tolerance Conditions, Emergency Evacuations, and Return to Service situations covered by adequate work instructions?

- Are safety system instruments and other measuring devices that monitor TSRs monitored for calibration? What controls are established to ensure proper calibration is maintained for TSR-related measuring devices?

- Have safety basis controls been established for the movement and control of Material-at-Risk (MAR)? How have these controls been incorporated in MAR-related work instructions? How will material holdup in the facility be handled during deactivation and decommissioning as it relates to MAR? How often is the building MAR reconciled?

Objective 2: ***Verify that facility personnel are knowledgeable of safety basis controls and requirements.***

Criteria:

2.1 Training and Qualification programs for facility and building managers, operations support, and operations personnel have been established, documented, and implemented. The programs cover the range of duties required as a result of the facility safety basis implementation.

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Review Approach

- Are USQ evaluators trained and qualified on the new safety basis? If USQ screens were used in the determination of procedures needing changes for the new safety basis, what process and what requirements were the evaluators trained on? Is the training documented?

- Is a documented training program in place that establishes safety basis-related training requirements for personnel assigned to the facility or working in the buildings? What controls are implemented to ensure that only trained workers are permitted to conduct activities in the facility? Are training records current and used? Do training records reflect safety basis-related training? Do they reflect requirements for USQ evaluators? Is there a continuing training program that treats safety basis-related aspects?

- How are support services personnel screened for required safety basis-related training? How are subcontractors' employees working in the facility trained in safety basis and other activity requirements? How do you ensure that new personnel receive the appropriate training prior to work in the facility?

- What requirements apply to the training provided to personnel assigned to stand fire watches?

- Are facility, support organization, and subcontractor personnel aware of safety basis-related facility functions, assignments, responsibilities, and reporting relationships?

- Does documented evidence exist to confirm that facility response personnel are current in their training?

2.2 Level of knowledge of the safety basis controls and of proper response to credible scenarios is adequate.

Review Approach

- Do interviews of operations personnel indicate proper understanding of the purpose and use of the safety basis controls?

- Do table-top exercises of credible scenarios involving use of the safety basis controls indicate adequate knowledge of proper response to the scenarios?

2.3 Training has been performed and documented to the latest revision of the facility safety basis and its implementing work instructions.

Objective 3: ***Verify that safety basis controls and requirements have been implemented*.**

Form 2 (Page 4)

Criteria:

3.1 Administrative Controls and associated surveillance requirements established through the safety basis are implemented or can be implemented in applicable facilities and programs.

Review Approach

- Is there adequate documented evidence that periodic inspections have been conducted to detect degraded drums, cans, and bottles containing radioactive material?

- Does a walkdown of the facility demonstrate that containers requiring venting are identified and any required venting and purging are performed?

- Does documented evidence demonstrate that the facility tracks chemicals and hazardous waste substances? Is a current inventory available? How is it maintained current? Are quantities below regulatory thresholds? Are changes to the inventory compared to the inventory relied on in the safety basis?

- Does a walkdown of the facility indicate that the chemical management program is adequately implemented?

- Does documented evidence demonstrate that surveillance requirements are being met?

3.2 There are sufficient numbers of qualified personnel to support the safe implementation of the controls established through the safety basis.

Review Approach

- How has minimum staffing been established to ensure sufficient support for the implementation of safety basis controls? How is it determined that staffing is not sufficient? What actions would be taken in this case?

- Are the training functions sufficiently staffed to ensure safety basis-related training is maintained current?

3.3 LCOs and associated Surveillance Requirements established through the safety basis are implemented or can be implemented in applicable complex facility programs.

Form 2 (Page 5)

Review Approach

- Does documented evidence demonstrate the scheduling and tracking of LCO- and AC-related SRs? How have grace periods been applied? Is documented and objective evidence available to demonstrate the scheduling and tracking of AC-related Surveillance Requirements? How are grace periods applied to AC-related surveillance requirements? Can grace periods be compounded?

- During the observation of the surveillance process, does the operator take appropriate actions to follow Conduct of Operations?

- Does documented evidence demonstrate that the facility has established an adequate baseline of the results of LCO and AC Surveillance Requirements?

Objective 4: ***Verify that safety systems and/or design features are consistent with the safety basis.***

Criteria:

4.1 Safety systems and/or design features are installed that are consistent with the descriptions and functions provided in the safety basis.

Review Approach: Does a walkdown of the safety systems and/or design features indicate that the installed systems are consistent with the descriptions and functions provided in the safety basis?

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Independent Implementation Verification Review (IVR) Checklist

Section 1 - Checklist IVR Facility and Safety Basis (SB) Change Information

IVR# : ____________________ Facility: ____________________ DSA/TSR Revision ____________

Safety Basis (SB) Change Description:

____
____
____

Date of Performance_________/____/_______

Section 2 - SB Documentation Verification

Instructions: Review affected SB documents to ensure that SB controls are adequately translated into governing facility documents and that SB controls have been, or can be, effectively implemented.

Note: Significant issues identified during checklist performance that could affect compliance with the SB, current or future, are to be immediately brought to the line management attention

SB Change Document Category	SB Controls Adequately Implemented/Documented?	
	Fully Implemented	**Independent Reviewer**
Technical Safety Requirements (TSRs)	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date
Conditions of Approval (COAs)	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date
USQ program is updated; checklists are updated; USQD evaluators have been trained	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date
Operations Orders	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date
Implementing Documents	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date
Job Hazard Analysis	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date
Drawings and other design documents	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date
Training Records	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No _______ / _______ ☐ N/A Intl Date

Form 3 (Page 2)

Surveillance Requirements (SR) Records	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date
In Service Inspection (ISI) Records	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date
Section 3 - SB Training Verification		

Instructions: Review training records and interview affected project personnel to determine the level of knowledge associated with the subject SB change(s).

Has a Job Task Analysis or similar tool been used to identify the populations of personnel directly affected by the SB change?

Yes ☐ No ☐

Have the facility's operations and support personnel been formally briefed about the SB change?

Yes ☐ No ☐ Attach a copy of the training roster to the checklist (optional).

Is the training material, including records and training conducted, current/appropriate for the SB change?

Yes ☐ No ☐

Do personnel interviewed demonstrate an understanding of the new or modified SB controls and basis for development of the control?

Yes ☐ No ☐

Note: If there are personnel requiring training to the SB change who have not received it because they were absent from the facility during the original training presentation(s), ensure that there is a plan to brief them on the SB change before re-assuming any applicable role(s) that are affected by the SB change.

Section 4 - Facility/System Modification Verification

Instructions: Examine facility systems and components affected by SB change(s) to ensure that modifications are complete and accomplished in accordance with approved design documents, and that requisite testing has been completed.

Facility/System Modification	Modification Complete and Tested?	
	Fully Implemented	**Independent Reviewer**
System/Component Modified	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date
System/Component Tested	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date	☐ Yes ☐ No ______ / _______ ☐ N/A Intl Date

Form 3 (Page 3)

Section 5 - Record of Review Activities

Instructions: Provide a brief listing of IVR assessment activities conducted.

- Documents Reviewed
- Personnel Interviewed
- Equipment/Activities Observed

Section 6 - Checklist IVR Findings

Instructions: List as findings, any implementation issues identified in Sections 2, 3, or 4 of this worksheet. Provide a brief description, and narrative for each finding. Finding descriptions and narratives must be sufficient to ensure that the line management can initiate appropriate corrective actions.

Note: While common issues (such as multiple instances of training deficiencies) may be grouped as a single finding, implementation deficiencies exhibiting a unique character should be identified as independent findings.

Section 7 – Certificate of Checklist Completion

I certify completion of the Checklist IVR for the subject SB change. With the exception of findings identified in Section 6 of this Checklist, the following implementation elements were verified:

- All applicable Checklist criteria and Checklist questions have been addressed using currently available facility information and IVR assessment techniques.
- Facility personnel have been provided appropriate training to implement the SB change, and have demonstrated adequate knowledge of the SB change.
- Requirements have been implemented into appropriate facility work instructions or Safety Management Program (SMP) documentation, and in my/our judgment.
- SB change(s) are verified to be implemented within the facility.

______________________________ ______________________________
Signature of Team Leader/Organization/Date Signature of Independent Reviewer/Organization/Date

Section 8 – Line Management

I acknowledge and accept the results documented on this Checklist IVR.

___________________________/________
Signature of Line Management Date

Form 4

Surveillance Requirements (SR) or In-Service Inspection (ISI) Verification Checklist

A verification checklist can be prepared for an In-Service Inspection (ISI) or Surveillance Requirements (SRs). Such a checklist can be prepared for each new or modified hazards control requiring a surveillance/inspection in a facility safety basis document to verify that affected standards have been mapped to their respective safety basis document. Initials and date indicate that the standard and steps used are accurate for the standard identified to meet the surveillance requirements and that the steps have been verified. The checklist should include surveillances performed for passive design features subject to deterioration. See the example checklist below.

Verification of SR/ISI performance is a critical step in establishing facility readiness to operate under new or modified safety basis controls. At a minimum, the IVR should verify that baseline SR/ISI data has been recorded and acknowledged by the facility operations staff. A more desirable approach would be to observe performance of the SR/ISR. In either case, if conduct of the SR/ISI cannot be demonstrated due to impact on facility operations under an existing safety basis, the IVR should status SR/ISI performance as a finding pending completion of surveillance/inspection activities.

A similar checklist should be developed to map facility SACs, or other administrative controls that include implied surveillance or control requirements, to their implementing standards.

Surveillance Requirement (SR) or In-Service Inspection (ISI) Verification Checklist					
SR/ISI		**Frequency**	**Standard**	**Standard Step**	**Verified by:**
4.3.1.1	Test each detector to verify response to a neutron source and an alarm state for the detector is received.	Once per month	YXX-ZZ-AA	X.Y.Z [a], “Detector Test”	________ Init/date

Form 5 (Page 1)

SAC Implementation Review Criteria

The following observations may be useful in supporting review of the implementation of SACs.

1. There is clear linkage from the SAC implementing procedure(s) to the TSR and its safety function.

2. The SAC has been written so that facility operators can perform the task(s) called for within the time and under the conditions assumed in the TSR/DSA. These factors need to be weighed in evaluating a SAC:

   - the adequacy of the description of the task(s) in the SAC implementing procedures;
   - the level of difficulty of the task(s);
   - operator training and capabilities;
   - the design of the equipment;
   - adequacy of feedback indicators such as indicators and alarms;
   - the time available to perform the task(s) and to recover from errors; and
   - actual facility conditions and stress levels caused by or complications created by work constraints or the work environment. These conditions among other should be considered: donning PPE, obtaining required approvals, security requirements, noise levels, heat/humidity, accessibility, and availability of communications equipment.

3. Changes to SAC requirements, documents, and instrumentation and controls and support equipment are (a) adequately designed, reviewed, approved, implemented, tested, documented, and (b) effectiveness is verified or validated by individuals or groups other than those who performed the work. Verification and validation work is completed before approval and implementation of the SAC. Only the current approved versions of SAC procedures are used.

4. Facility personnel responsible for implementing the SAC have been fully trained and qualified on SACs in general and specifically on the SAC being implemented. This requirement includes training of qualified observers who may be performing independent verifications. SAC re-qualification requirements and associated frequencies are defined, adequate, and met.

5. Facility operating processes, protocols, and procedures do not allow the facility to operate in modes or under conditions where the SAC is required but where full compliance has not been confirmed. Confirmation of SAC compliance during required modes of operation is documented.

Form 5 (Page 2)

6. SACs should be evaluated against the guidance in DOE-STD-1186-2004. In particular, the effectiveness of SACs should be evaluated against the measures outlined in Section 3 of that Standard. SACs that do not contain at least one or more of the recommended attributes would generally be considered inadequate.

~~Better: When performing an ANALOG CHANNEL OPERATIONAL TEST, the entire instrumentation loop (except sensor), including the annunciator light, should be checked. When performing a CHANNEL CALIBRATION, annunciators need not be checked.~~

- ~~Long: If, in the course of testing of valve stroke times, it is found that any valve exhibits a stroke time that is 25 percent greater than the stroke time measured during a previous test of the same valve, the test frequency of the valve shall be increased to once per month until corrective action is taken, at which time the original test frequency shall be resumed.~~

~~Better: When testing valve stroke times, if any valve is found to have a stroke time 25 percent greater than when previously tested, increase its test frequency to once per month. When corrective action is taken, resume the original test frequency.~~

~~A.3.3 Positive Versus Negative Sentences~~

~~Where possible, use positive sentences instead of negative sentences.~~

- ~~Negative: High steam pressure is not uncommon under such conditions.~~

  ~~Positive: High steam pressure is common under such conditions.~~

- ~~Negative: If at least one pump cannot be put back into service, . . .~~

  ~~Positive: If no pump can be put back into service, . . .~~

~~A.3.4 Active Versus Passive Sentences~~

~~Where possible, use sentences with active instead of passive verbs.~~

- ~~Passive: System pressure is relieved by PORVs when . . .~~
  ~~Active: PORVs relieve steam pressure when . . .~~

- ~~Passive: This limitation provides assurance that . . .~~
  ~~Active: This limitation ensures that . . .~~

~~A.4 Brevity in Writing~~

~~A.4.1 Unnecessary Words and Phrases~~

~~Economy in writing is reached by omitting needless words and phrases and by phrasing information succinctly. Below are examples of ways to simplify sentences and phrases.~~

- ~~Wordy: Fire Detectors that are used to actuate Fire Suppression Systems represent a more critically important component of the facility's Fire Protection Program than detectors that are installed solely for early fire warning and notification.~~

  ~~Better: Fire Detectors that actuate Fire Suppression Systems are more important to the facility's Fire Protection Program than detectors used solely for early fire warning.~~

- ~~Wordy: In-service inspection of heat exchangers is essential in order to maintain surveillance of the conditions of the tubes in the event that there is evidence of mechanical damage or progressive degradation due to design, manufacturing errors, or in-service conditions that lead to corrosion.~~

  ~~Better: In-service inspection of heat exchangers is required to ensure there is no damage or progressive degradation of the tubes caused by design or manufacturing errors or corrosion.~~

~~Wordy~~	~~Better~~
~~along with, as well as . . .~~	~~and~~
~~in the event . . .~~	~~if . . .~~
~~in order to . . .~~	~~to . . .~~
~~for the purpose of . . .~~	~~for, to . . .~~
~~it is dependent upon . . .~~	~~it depends on . . .~~
~~Each of the curves shows . . .~~	~~Each curve shows . . .~~
~~give consideration to . . .~~	~~consider . . .~~
~~initiated immediately~~	~~started at once~~
~~more frequent intervals~~	~~more frequently~~

~~In the following examples, the underlined words can be left out of the sentences with no loss in meaning but with a gain in economy of expression. The underlined words add nothing to the sense of the sentences.~~

- ~~The purpose of the drains is to remove water from the turbine.~~
- ~~Two alarm signals serve to indicate that the pump is not working.~~
- ~~The thermocouples are designed to sense metal temperature variations.~~
- ~~The phase relationship between the generator output and the applied load is very critical.~~
- ~~A pressure switch located on the seal oil supply unit . . .~~
- ~~Do not remove any tools from the work area without proper authorization.~~

~~A.4.2 Abbreviations, Acronyms, and Symbols~~

~~Use only those abbreviations, acronyms, and symbols that are clearly recognized by the user. Avoid abbreviations of words, phrases, or names unless the system or component is frequently and commonly abbreviated. Following are common symbols that should be used in TSRs. Except for °F and °C, symbols should be avoided in narrative text. When space is limited, such as in tables or figures, symbols should be used for brevity and to save space.~~

~~Symbol~~	~~Meaning~~
~~=~~	~~Equal to~~
~~%~~	~~Percent~~
~~°F~~	~~Degrees Fahrenheit~~

~~Symbol~~	~~Meaning~~
~~°C~~	~~Degrees Celsius~~
~~+~~	~~Plus~~
~~–~~	~~Minus~~
~~<~~	~~Less Than~~
~~>~~	~~Greater Than~~
~~<=~~	~~Less Than or Equal To~~
~~>=~~	~~Greater Than or Equal To~~

~~A.4.3 Capitalization~~

~~In general, standard American English rules for capitalization should be used. The following guidelines apply to writing TSRs.~~

- ~~Use of Uppercase Letters. Write the following in uppercase letters:~~
  - ~~defined terms;~~
  - ~~requirement titles and systems when used as page or LCO headings;~~
  - ~~acronyms;~~
  - ~~the word NOTE when used as a heading;~~
  - ~~logic terms used as connectors, e.g., AND, OR, EITHER, etc.;~~
  - ~~table column headings; and~~
  - ~~headings in the LCOs and bases (see Figures 10a and 14 of this Guide).~~
- ~~Use of Initial Uppercase Letters (First Letter in Each Word). Capitalize the first letter in the following:~~
  - ~~each word in system titles,~~
  - ~~each word in component nomenclature,~~
  - ~~each word in a system or component reference,~~
  - ~~proper nouns,~~
  - ~~each word in major system names, and~~
  - ~~each word in figure and table titles.~~

~~A.4.4 Punctuation~~

~~In general, use standard American English rules for punctuation. Do not use contractions of words. For example, use "cannot" rather than "can't" or "is not" rather than "isn't."~~

~~A.4.5 Units of Measure~~

~~Use the following guidelines for units of measure.~~

- ~~Use the units that appear on instruments or gauges whenever possible.~~
- ~~Use units familiar to the operators.~~
- ~~Use Arabic numerals unless specific equipment dictates otherwise.~~

~~A.4.6 Tolerances~~

~~Use the following guidelines when writing tolerances.~~

- ~~Provide acceptable tolerances for given values whenever possible.~~
- ~~Give tolerances in easily understood terms.~~
- ~~Do not use the plus symbol (+) to express tolerances. When possible, state the value as an acceptable range (i.e., "between xx and yy"). The + symbol may be used as a heading where a list of values is to be entered, as in the following example.~~

  ~~Pressure (+ 10%)~~

  ~~______psig~~

  ~~______psig~~

  ~~In this application, the + symbol is used as an acceptable tolerance for calculating actual values, which should then be written as acceptable ranges in the table.~~

~~A.4.7 Formulas and Calculations~~

~~Formulas and calculations should be avoided in TSRs when possible. Unless the formula or calculation is part of an instruction or procedure that must be performed by the user, formulas or calculations can usually be avoided.~~

~~3 CONVERSION OF TECHNICAL SPECIFICATIONS/OPERATIONAL SAFETY REQUIREMENTS TO TECHNICAL SAFETY REQUIREMENTS~~

~~This~~

Appendix D: Conversion of Technical Specifications and Operational Safety Requirements to Technical Safety Requirements

This appendix gives contractors guidance on ~~conversion of Department of Energy (DOE)~~ converting DOE-approved technical specifications (TSs) and operational safety requirements (OSRs) into ~~Technical Safety Requirements (TSRs).~~TSRs. Appendix D is only applicable for those DOE nuclear facilities that have not developed TSRs per 10 C.F.R. 830 Subpart B.

~~B.1 Conversion of Existing Technical Specifications~~

~~For reactor facilities with existing~~**Converting TSs** ~~that have not been formatted as~~**to TSRs**~~, the~~

This conversion can be ~~assisted with the use of~~guided by a screening form such as that shown in Figure ~~B~~D.1. This form would be used for each ~~existing requirement.~~TS. Any requirement that generated a positive response to any of the seven criteria would be included in the TSR. Specifications being added to the TSR could be categorized as ~~Safety Limit (~~SL~~), Limiting Control Setting (~~, LCS~~),~~, or ~~Limiting Condition for Operation (~~LCO~~)~~, according to the guidance in Section 4.~~10.1~~2 of this Guide.

~~B.2 Conversion of Existing Operational Safety Requirements~~

2 Converting OSRs to TSRs

For nuclear facilities with existing OSRs that have not been formatted as TSRs, the conversion can be assisted with the use of a screening form such as that in Figure ~~B~~D.2. This form would be used for each existing requirement. Any requirement that generated a positive response to any of the seven criteria would be included in the TSR. Requirements being transferred to the TSR could be categorized as SL, LCS, or LCO according to the guidance in Section 4.~~10.1~~2 of this Guide.

~~B.~~3 Additions to ~~Existing Technical Specifications~~TSs and ~~Operational Safety Requirements~~ OSRs

After the ~~Documented Safety Analysis (DSA) has been developed according to requirements of~~conversion process is completed, the ~~DSA rule, the~~applicable DSA's section on TSR derivation should be used to ensure that all ~~of the~~ necessary TSRs have ~~been developed in the conversion process. As in~~resulted from the conversion process~~, Section 4.10.1 of this Guide should be used to help categorize the requirements as SLs, LCSs, LCOs or SRs.~~ .

TECHNICAL SPECIFICATION LIMITING CONDITION FOR OPERATION (LCO) SCREENING FORM

TECHNICAL SPECIFICATION NUMBER: ______________________ Page ___of ___

EVALUATION

Is the technical specification applicable to—	YES	NO
A. Installed instrumentation used to detect and indicate in the control room or other control location a significant degradation of physical barriers that prevent the uncontrolled release of radioactive or other hazardous materials; or		
B. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate an accident or transient that involves the assumed failure of, or presents a challenge to, the integrity of a radioactive or other hazardous material barrier; or		
C. A process variable that is an initial condition to a design basis accident or transient that involves the assumed failure of, or presents a challenge to, the integrity of a radioactive or other hazardous material barrier; or		
D. Experiments or experimental facilities that could provide a path for the uncontrolled release of radioactive or other hazardous material or that could affect criticality; or		
E. Systems and equipment used to handle fissile material outside the reactor core; or		
F. Systems and equipment needed for Defense-in-Depth per DOE-STD-3009 to prevent a challenge to safety class systems or a significant challenge to physical barriers that protect against an uncontrolled release of radioactivity; or		
G. Systems and equipment needed for worker protection per DOE-STD-3009 to prevent serious injury or life threatening hospitalization to workers.		

If the answer to any of the above is "yes," and the item is needed to keep off-site dose below the Evaluation Guideline of 25 rem CEDE, then the technical specification should be included in the LCOs unless justified otherwise. For items marked "yes" for Defense-in-Depth or worker safety, although most items should become LCOs in the TSR, some may be identified as only administrative controls.

Figure ~~B~~D.1. Example Technical Specification LCO Screening Form~~.~~ (Page 1).

TECHNICAL SPECIFICATION LIMITING CONDITION FOR OPERATION (LCO) SCREENING FORM (continued)

TECHNICAL SPECIFICATION NUMBER: ________________________ Page ___of ___

DISCUSSION

Explain why the specification does or does not meet the criteria and note any special considerations why a particular specification should or should not be included in the TSR (attach additional pages if necessary).~~-~~ This part should also include the following specific information.		
If the specification is found to meet criterion "B" or "C" above, provide examples of the accidents or transients for which the specification represents an initial condition or that it is assumed to mitigate.		
Where a component, structure, or system has more than one purpose or function that is addressed in technical specifications, reference the other specifications for the other functions.		
If the specification does not meet any of the criteria, a short description of the requirements should be provided.		
CONCLUSION: This technical specification is included in the Technical Safety Requirements.	**YES**	**NO**

Figure ~~B~~D.1.~~-~~ Example Technical Specification LCO Screening Form (~~continued~~Page 2).

OPERATIONAL SAFETY REQUIREMENTS LIMITING CONDITION FOR OPERATION (LCO) SCREENING FORM

OPERATIONAL SAFETY REQUIREMENTS NUMBER: ____________ Page ___of ___

EVALUATION

Is the operational safety requirement applicable to—	**YES**	**NO**
A. Installed instrumentation that is used to detect and indicate in the control room or other control location a significant degradation of the physical barriers that prevent the uncontrolled release of radioactive or other hazardous materials; or		
B. A structure, system, or component that functions or actuates to mitigate an accident or transient that involves the assumed failure of, or presents a challenge to, the integrity of a physical barrier that prevents the uncontrolled release of radioactive or other hazardous materials; or		
C. A process variable that is an initial condition for those design basis accidents or transient analyses that involve the assumed failure of, or presents a challenge to, the integrity of a radioactive or other hazardous material barrier; or		
D. Experiments and experimental facilities that could provide a path for the uncontrolled release of radioactive or other hazardous materials or that could affect criticality; or		
E. Systems and equipment used to handle fissile materials; or		
F. Systems and equipment needed for Defense-in-Depth per DOE-STD-3009 to prevent a challenge to safety class systems or a significant challenge to physical barriers that protect against an uncontrolled release of radioactivity; or		
G. Systems and equipment needed for worker protection per DOE-STD-3009 to prevent a serious injury or life threatening hospitalization to workers.		

If the answer to any of the above is "yes," and the item is needed to keep off-site dose below the Evaluation Guideline of 25 rem CEDE, then the operational safety requirement should be included in the LCOs unless justified otherwise. For items marked "yes" for Defense-in-Depth or worker safety, although most items should become LCOs in the TSR, some may be identified as only administrative controls.

Figure ~~B~~D.2. Example Operational Safety Requirements LCO Screening Form. (Page 1).

OPERATIONAL SAFETY REQUIREMENTS LIMITING CONDITION FOR OPERATION (LCO) SCREENING FORM (continued)

OPERATIONAL SAFETY REQUIREMENTS NUMBER: ____________ Page ___of ___

DISCUSSION

Explain why the requirement does or does not meet the criteria and note any special considerations why a particular requirement should or should not be included in the TSR (attach additional pages if necessary).~~-~~ This part should also include the following specific information.		
If the requirement is found to meet criterion "B" or "C" above, provide examples of the accidents or transients for which the specification represents an initial condition or that it is assumed to mitigate.		
Where a component, structure, or system has more than one purpose or function that is addressed in operational safety requirements, reference the other requirements for the other functions.		
If the requirement does not meet any of the criteria, a short description of the requirements should be provided.		
CONCLUSION: This operational safety requirement is included in the Technical Safety Requirements.	**YES**	**NO**

Figure ~~B~~D.2. Example Operational Safety Requirements LCO Screening Form (~~**continued)**.~~

~~4 TECHNICAL SAFETY REQUIREMENT CONSIDERATIONS FOR NUCLEAR EXPLOSIVE OPERATIONS, INCLUDING TRANSPORTATION~~

~~Technical Safety Requirements (TSRs) for nuclear explosive operations (NEOs) are derived in the hazard analysis report (HAR) (referred to as HAR-TSRs) in the same manner that TSRs for facilities are derived in the Documented Safety Analysis (DSA). Thus, TSRs for NEOs include safety limits (SLs), limiting control settings (LCSs), limiting conditions for operation (LCOs), administrative controls (ACs), and design features.~~

~~The historical use of TSRs, including their reactor equivalent technical specifications, was primarily aimed at operability requirements for safety systems, structures, and components (SSCs) as LCOs. Hands-on activities and programmatic requirements were recognized collectively in the ACs section of the TSRs. The TSR ACs, such as training, staffing, review and audit, or programs and procedures, were implemented through various facility documents and activity controls. Generally, TSR violations related to implementation of ACs result from gross failure to implement a programmatic requirement in its entirety. By contrast, a single failure in violation of hardware-based TSR controls, such as LCOs, would constitute a TSR violation.~~

~~This construct needs to be modified somewhat for NEOs, where significant unsafe conditions can readily be created by an operator error in a single step of an operation. TSRs for NEOs must reflect this significant shift for safety assurance from primary reliance on safety SSCs to manual operations and their associated ACs. This shift can be made transparent in the TSRs, but more importantly, it should also be accompanied with a higher emphasis on implementation of ACs on the operating floor through rigor of programmatic implementation and procedure attention. Methods that can be used may include required authorization levels, increased level of detail, step-by-step sign-off, two person execution, independent sign-off, preestablished alternative actions, and increased oversight and audit.~~

~~Alternatively, some of the shift can be made explicit in the TSR ACs by uniquely identifying specific requirements in the ACs as cause for TSR violation if missed. An example could be failure to attach a restraining device that prevents drops of an exposed primary. On the other hand, the multitude of offenses and circumstances that could result in violation are too numerous for all to be identified specifically in the ACs, and a proper degree of balance must be struck. This approach is a departure from past practice for typical nuclear facilities where judgment of violation of ACs was always made on a case-by-case basis, taking into account specific circumstances and the degree of actual compromise to safety.~~

~~TSR coverage of controls that address fire or explosive-driven dispersal of fissile material and higher consequence events are required regardless of the magnitude of the off-site consequences. This could be more conservative in certain instances than the application of evaluation guidelines for safety class designation as envisioned in DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, dated July 1994, Change Notice 3, dated March 2006, Appendix A. It is an acknowledgment that fire may progress to explosive dispersal of fissile material and that any explosive dispersal may progress to higher consequence events. It also accommodates the higher degree of uncertainty in the present level of understanding of these phenomena.~~

~~DOE O 452.2D, *Nuclear Explosive Safety*, dated 4-19-09, or successor documents, establishes nuclear explosive safety rules (NESRs) as the controls associated with the highest level of consequences, including explosive dispersal of fissile material and higher consequence events. DOE O 452.2D specifies five general NESRs and mandates allowance for including supplemental NESRs to be developed as needed in the HAR. HAR-derived NESRs address specific characteristics of an individual nuclear explosive operation.~~

~~The five general NESRs in DOE O 452.2D, or successor documents, are as follows.~~

1. ~~A nuclear explosive safety study must be approved before operations.~~

2. ~~Nevada Test Site is the only facility where operations with nuclear explosives not one-point safe are permitted.~~

3. ~~No production operations are permitted until nuclear explosives are certified as one-point safe by the design laboratory.~~

4. ~~Operations on collocated main charge and fissionable material must be done with procedures.~~

5. ~~If a nuclear explosive no longer meets one-point safe, discontinue all production plant operations for off-site transportation, as appropriate, and conduct an approved NES study before restart.~~

~~When addressing these NESRs, only the last two NESRs, which are implemented by the operator at the floor level, should be included in the HAR-TSRs. This is because the completion of the first three general NESRs above precedes in time any specific nuclear explosive operation. These three general NESRs are not consulted, implemented, or checked by the operators at the floor level during actual operations. In fact, they must all be met through design and weapons laboratory certification or Department of Energy (DOE) or contractor management authorization or approval long before operations for a specific nuclear explosive operation commence. For this reason, it is not appropriate for these controls to be implemented through TSRs. Instead, the TSRs are focused mainly at equipment operability after design, procurement, installation and initial testing, and approval authority for start-up and operation. It is the operability of equipment and ACs derived in the HAR, which operations personnel on the floor deal with on a daily basis, which must be checked periodically for operability or performance. That is the domain of the TSR.~~

~~TSRs FOR TRANSPORTATION OF NUCLEAR EXPLOSIVES~~

~~TSRs for transportation of nuclear explosives [and certain other sensitive components such as nuclear explosive-like assemblies (NELAs)] involve both on-site and off-site transport. Off-site transport of all other DOE fissile or radiological material is governed by Department of Transportation regulations. Generic on-site transportation of nuclear explosives is covered in the on-site transportation DSA, and operation-specific on-site transportation operations are covered in HARs. TSRs for on-site transportation may be affected by specific nuclear explosive considerations such as ramp transport; closeness of approach to loading docks, magazines, bays,~~

~~and cells; and use of special intrazone transport devices such as flatbeds, forklifts, and jack motors.~~

~~No SLs or LCSs are expected for transportation activities because there are no processes or activities in which the operator intentionally causes a process variable to be manipulated that, if left unchecked or uncontrolled, would result in catastrophic failure of a passive safety barrier. For example, there are no operator-initiated processes to increase temperature, pressure, electrical, or mechanical insult to the weapon that could lead to catastrophic failure.~~

~~Most accidents, especially in off-site transportation, result from the types of events that are not subject to SLs and LCSs, such as collisions, rollovers, skids, and loss of control of the transport carrier itself. While these accidents are related to the operator carrying out a mission (transport from point A to point B), they are not directly under his control. Thus, only LCOs, design features, and ACs are envisioned for transportation activities. LCOs or design features are expected for the nuclear explosive, its container and tie downs, and only specially designed-in or added features of the over the road or air transport carriers whose purpose is to achieve a functional safety requirement credited in the accident analysis.~~

~~5 PERFORMANCE OF IMPLEMENTATION VERIFICATION REVIEWS (IVRs) OF SAFETY BASIS CONTROLS~~

~~1. PURPOSE~~

~~This Appendix describes approaches for performing independent implementation verification reviews of all controls designed to implement the Safety Basis, e.g., Technical Safety Requirements (TSRs) and Documented Safety Analysis (DSA) assumptions and commitments, including verification of their initial implementation, verification following changes to the Safety Basis, and periodic re-verification.~~

~~The purpose of an IVR is to independently confirm the proper implementation of new or revised Safety Basis controls.~~ Independence of the review adds an additional layer of defense in depth and is a common practice standard in the commercial nuclear power industry. ~~IVRs support meeting the 10 CFR 830.201 requirement for operating contractors for Hazard Category 1,~~Page 2~~, or 3 nuclear facilities to "perform work in accordance with the facility Safety Basis" and 10 CFR 830 Subpart A, *Quality Assurance Requirements*, in particular the requirement to have quality processes that include the planning and conduct of independent assessments to measure item and service quality, to measure the adequacy of work performance, and to promote improvement.~~).

~~Independent implementation verification of new or revised Safety Basis controls is often accomplished as part of a nuclear facility startup or restart readiness review under DOE Order 425.1D, *Verification of Readiness to Start Up or Restart Nuclear Facilities*. This guidance is not intended to duplicate the verification process under DOE O 425.1D. This guidance is chiefly intended for application to new or revised Safety Basis controls being implemented in a nuclear facility with on-going operations where a startup or restart review under DOE O 425.1D is not invoked. However, if desired, the process can be used as a tool by line management to ensure proper implementation prior to declaring "readiness" for the startup or restart readiness review.~~

~~This Appendix was developed based upon a distillation of best practices for conducting IVRs at DOE sites.~~

2. APPLICABILITY AND SCOPE OF APPENDIX

~~This Appendix is intended for use by DOE and DOE contractor organizations responsible for Hazard Category 1, 2 and 3 nuclear facilities. This Appendix applies to all hazard controls identified in TSRs and DSA assumptions and commitments for the Hazard Category 1, 2, and 3 nuclear facilities including design features, safety systems, specific administrative controls and associated major input assumptions for the Safety Basis that are contained in the TSRs and DSA assumptions and commitments. However, as recommended in this Guide, the most important commitments and assumptions should already be captured in the TSRs. The scope of this Appendix includes initial verification of Safety Basis controls for new DSAs and DSA revisions (both major and minor) as well as periodic review of the continued effective implementation of Safety Basis controls.~~

~~This Appendix is focused on IVRs performed by contractors responsible for the operation of DOE Hazard Category 1, 2, and 3 nuclear facilities, but also provides guidance for DOE oversight and performance of IVRs.~~

~~The Appendix is limited to independent verification of the implementation of Safety Basis hazard controls. It does not address the review of the Safety Basis documentation itself that identified the hazard controls in the first place or their incorporation into TSRs as required by 10 CFR 830.207, *DOE Approval of Safety Basis*. DOE Guide 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*, provides guidance for the review of the Safety Basis documentation.~~

~~If issues concerning the Safety Basis become evident during the verification process, they should be handled via the facility's existing issues management processes for resolving such matters.~~

~~The process for carrying out IVRs should be documented in individual site procedures.~~

~~3. TIMING OF IVR SAFETY BASIS HAZARD CONTROLS~~

~~3.1. Initial IVRs~~

~~The initial contractor IVR should follow the initial implementation effort of the new Safety Basis and should be completed prior to the contractor declaring readiness to commence formal operation under the new Safety Basis controls.~~

~~The DOE IVR (if performed) may be stand-alone or as part of its line-management oversight of the contractor readiness process. Prior to starting the IVR, contractor management should ensure that the Safety Basis has been fully implemented. The following are attributes of a fully implemented Safety Basis.~~

- ~~Safety Basis controls have been incorporated into implementing procedures and work control documents.~~
- ~~Implementing procedures are executable as written.~~
- ~~Operators and facility personnel are trained and knowledgeable on the new controls and their relationship to the Safety Basis.~~
- ~~Required surveillance activities and inspections are complete.~~
- ~~Surveillances correctly test or verify assumptions and requirements of the Safety Basis.~~
- ~~Physical changes associated with the Safety Basis change have been made and tested under a rigorous startup test process to verify operability in accordance with the design basis.~~
- ~~Configuration items have been updated to reflect Safety Basis changes.~~
- Labeling of components identified in updated safety systems has been completed.

- Inventory control procedures have been evaluated for consistency with the new ~~Safety Basis.~~

- Process instruments, tools, and measuring and test equipment have been calibrated and tested.

~~Contractors often create and utilize a Safety Basis flow down matrix to support ensuring proper implementation of the Safety Basis controls.~~

~~3.2 IVRs Following Safety Basis Changes~~

~~Following a Safety Basis change, the contractor IVR should be performed prior to commencing formal operation under the revised Safety Basis~~

~~The breadth of the IVR should encompass the entire Safety Basis change, i.e., Safety Basis controls that have been changed should be verified to have been implemented. However, the depth/level of detail and degree of formality of the review can be graded. The following are broad categories of Safety Basis modifications that can be used to support determining the depth/level of detail and degree of formality of the IVR.~~

- ~~Major Changes – Multiple changes, physical alterations of credited components, changes in methods used to demonstrate operability of TSR hazard controls. Major changes could potentially affect the ability to comply with the Safety Basis.~~

- ~~Moderate Changes – Safety Basis changes that may be judged to warrant review prior to their use when they are more complex than editorial changes or involve changes in multiple acceptance criteria for safety class or safety significant items.~~

- ~~Minor Changes – Editorial changes.~~

~~For major changes, the IVR should utilize more formal tools such as a review plan and criteria and review approach documents (CRADs) (see Form 1 for an example of a CRAD). For moderate changes, review plans and CRADs may not be needed (i.e., a simple checklist may suffice) or they may be graded in the depth of the review. For minor changes, an IVR plan is likely not needed and a simple checklist (see Form 2) would suffice.~~

~~The scope of a DOE IVR, if performed, can be determined based upon these same factors as well as considering past performance/effectiveness of contractor IVRs.~~

~~3.3 Ongoing IVRs to Re-verify Safety Basis Control Implementation~~

~~The re-verification of Safety Basis controls is an important tool for contractors to ensure that they continue to operate the facility in accordance with the Safety Basis.~~

~~Many of the hardware controls will have surveillance requirements that periodically ensure they are operable to perform as documented in the Safety Basis. In general, re-verification of Safety Basis controls should be performed every 3 to 5 years as part of the contractor's ongoing assessment process. Safety controls that are susceptible to the effects of the degradation of human knowledge (e.g., procedural controls) typically should be re-verified at least every 3~~

~~years, and controls dependent upon hardware functionality typically should be re-verified at least every 5 years.~~

~~The following factors should be considered in determining the specific frequency, scope, and depth of re-verification of a Safety Basis control.~~

- ~~Safety significance of Safety Basis control~~

- ~~Type of Safety Basis control and susceptibility to degradation~~

- ~~Extent of Safety Basis~~ control changes that have accumulated since the last IVR

The basis for the periodicity of IVRs should be described and documented in individual site implementing procedures.

~~The overall effectiveness of safety management programs referenced in TSRs (e.g., nuclear criticality safety and fire protection) is normally ensured by specific assessments already required for each of those programs.~~

~~Re-verification of a facility's Safety Basis controls can be approached in many forms, from a full review conducted by a team that re-verifies all the facility's Safety Basis controls in one focused review to a phased re-verification review process (e.g., a fraction of the controls being reviewed each year) that ensures all of a facility's Safety Basis controls are re-verified over a period of time.~~

~~The benefit of the periodic team review is that it ensures all Safety Basis controls will be reviewed in an integrated fashion. The downside of a periodic review is that it is manpower- and cost-intensive. A phased IVR re-verification process, depending on how it is structured, might not be as effective in identifying cross-cutting Safety Basis control issues; however, it can be easily integrated into the facility's existing contractor assessment and DOE oversight processes and may be more cost effective.~~

~~DOE may also choose to perform periodic re-verification of Safety Basis controls. This can be performed as part of DOE's normal oversight efforts (e.g., reviews conducted by the Safety System Oversight staff, Facility Representatives, or through DOE shadowing of contractor IVR activities) and may not be as formal or detailed as the contractor re-verification. This should be determined as part of the DOE's integrated oversight planning.~~

~~4. IVR PLANNING AND CONDUCT~~

~~As discussed previously, for major, or in some cases moderate, changes in the Safety Basis, a formal IVR plan should be developed. A formal IVR plan is also useful for performing re-verification of Safety Basis controls. The following are useful elements to include in an IVR plan:~~

- ~~Scope of the implementation verification including clear identification of the breadth and depth of review based on a grading of the changes~~

- ~~Staffing~~

- ~~Methods for performing the implementation verification (i.e., procedures, checklists or CRADs)~~
- ~~Schedule~~
- ~~Documentation of the results of the implementation verification~~

~~IVR plans should be approved by the responsible manager(s) (e.g., Quality Assurance, Safety Basis and/or contractor facility manager). Form 3 provides an example outline of an IVR plan.~~

~~The contractor IVR plan should be consistent with normal site practices for developing review plans and be an element of an overall contractor assurance system. Similarly, if used, the DOE plans should be consistent with contractor assessment plans and be part of the line integrated assessment program.~~

~~If a phased approach is utilized for performing re-verification, it can be beneficial to develop a plan that covers the complete re-verification and which specifies items to be reviewed, the method of review, and schedule for each phase of the review.~~

~~4.1 Selection of IVR Team Leader and Support Staff~~

~~The Implementation Verification Review Team Leader **or individual assessors should have sufficient authority and freedom from line management** *responsible* **for the Safety Basis controls to be evaluated by** *the IVR. Assessors should not have been involved in implementing the controls to be verified.* Team Leader experience in the conduct of readiness reviews is desired in a manner similar to that determined for leaders of readiness reviews under DOE O 425.1D.~~

~~Implementation verification support staff that performs the verification of the Safety Basis control implementation should be experienced in the technical area being reviewed. For example, if the control is an instrumentation and control system, qualification in this subject matter is desired. Members should not review work in which they were involved. The size and makeup of the contractor team will depend upon the scope and depth/level of detail of the review.~~

~~The DOE IVR team makeup should be determined based on a graded approach that considers the scope and complexity of the Safety Basis changes. Good candidates for the DOE team include personnel with Team Leader experience and operational readiness review experience, Facility Representatives (FRs), Safety System Oversight (SSO) engineers, senior operations and maintenance personnel from other similar facilities, and other subject matter experts.~~

~~Not all IVRs will require the formation of teams. IVRs of a simple nature may be performed by individuals who have not been involved in the implementation of the Safety Basis documents being reviewed or do not have responsibility for the work affected by the Safety Basis changes reviewed by the IVR.~~

~~4.2 Method for Performing Implementation Verification of Safety Basis Controls~~

~~The method for verifying the control will vary depending on the type of the control. The following sections provide guidance for performing in depth implementation verification of the various Safety Basis controls.~~

~~4.2.1 Design Features and Safety Systems~~

~~Implementation verification of design features and safety systems should include a review of documentation of the design and installation of the design feature/safety system and a walkdown of the design feature/safety system utilizing design documents (e.g., design drawings). The walkdown would verify that certain design features/safety systems (e.g., seismic restraints and fire barriers) are in place, and for safety-class and safety-significant items that the appropriate level of quality assurance guided procurement, construction and testing. Particular attention should be paid to any installed Temporary Modification. Implementation verification of safety systems may also include a review of startup testing to ensure that key system functions were properly tested. The extent (breadth and depth) of the review should be predicated on the complexity of the design feature and/or safety system and its importance.~~

~~4.2.2 Procedures~~

~~Safety Basis controls may be implemented via numerous types of procedures including surveillance procedures, administrative control procedures, operating procedures, maintenance procedures, and inspection and testing procedures.~~

~~Maintenance, inspection and testing, and surveillance procedures which implement Safety Basis controls should be reviewed to ensure that they include limits, precautions, prerequisite conditions, applicable TSRs, acceptance criteria, required data to be recorded, and personnel qualifications. These procedures should also be reviewed to determine whether they require the recording and timely notification of facility management of any discrepancies or unexpected conditions. Typically sites will utilize a checklist to support their review of TSR surveillances. An example of a TSR surveillance checklist is provided in Form 4. Depending upon the level of depth of review, the IVR can include a walkdown of the procedure with responsible facility personnel, observation of the procedure being performed, or review of procedure execution records.~~

~~The review of surveillances should include an evaluation of the mechanism (e.g., schedule) used to ensure they are conducted when required, and whether they are consistently being performed on time.~~

~~The verification of specific administrative controls (SACs) should include the review of SAC implementing procedures and the observation of in-facility execution of the procedure (or walkdown with contractor personnel responsible for executing the procedures) to ensure the procedures appropriately implement the SAC consistent with facility conditions, are understandable (contain clear and concise work instructions with necessary detail), are practical and usable, and are adequate for meeting the functional requirements and expectations of the SAC TSR. Form 5 provides some additional criteria to support this verification.~~

~~4.2.3 Training Programs and Personnel Level of Knowledge~~

~~Operators, maintenance personnel, and technicians and engineers that implement and maintain Safety Basis controls are trained and qualified on the work and related sections of the Safety Basis that identify the controls. The IVR should evaluate: training on the need and functions of the controls; personnel ability to effectively verify that the controls can reliably perform their safety function; and that the operators can perform any required safety functions in relation to those controls. The level of knowledge of operations personnel of Safety Basis controls can be examined by interviews and cross- table scenarios.~~

~~The verification that Safety Basis controls have been appropriately incorporated into training programs should include a review of documentation that a systematic approach to training was used as required by DOE O 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*.~~

~~**4.3 Documentation of the Results of the IVR**~~

~~The results of the IVR should be documented per normal site procedures for documentation of safety-related assessments, including identification of issues that require corrective actions to resolve the weakness.~~

~~The attached forms are provided as examples for documenting the results of the IVR. They can be shortened or expanded as necessary. To ensure consistency of IVRs, IVR documentation forms should be included in the site specific implementing procedures.~~

~~**5. REFERENCES**~~

- ~~DOE-STD-3006-2010, *Planning and Conducting Readiness Reviews*~~
- ~~DOE-STD-1186-2004, *Specific Administrative Controls*~~
- ~~DOE O 425.1D, *Verification of Readiness to Startup or Restart Nuclear Facilities*~~
- ~~DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*~~

~~**Form 1**~~

~~**Example: Criteria Review and Approach Document (CRAD) to Support IVRs**~~

~~The following are example CRADs. The CRADs used for IVRs need to be tailored to the Safety Basis controls being verified. Some review approaches will be based on document review while others will be performed by interviews or physical inspections.~~

~~**Objective 1:** ***Verify that the Safety Basis controls and requirements are incorporated in appropriate facility documents and work instructions.***~~

~~**Criteria:**~~

1.1 Administrative Controls, implementing processes, and supporting surveillance requirements are adequately documented in reviewed and approved work instructions.

Review Approach

- Are controlled, accurate, and current copies of the TSR available where needed?

- Are there adequate and correct work instructions for implementing the Surveillance Requirements associated with Administrative Controls? ~~Are accurate data sheets provided?~~

- Describe the documented work processes used to control waste crate and container handling within the building. ~~What control prevents the storage of TRU drums and crates outside the facility? Does the Safety Basis allow storage of low-level waste (LLW) crates outside the facility and what process is used to manage the configuration and locations of LLW crates stored outside the building?~~

- How are limits established, implemented, and maintained for required sizing and spacing between each combustible package and other items of concern?

- ~~Combustibles may be stored for 15 minutes in previously approved corridors without meeting spacing requirements. What process controls this condition and how is the time material is stored recorded? What control prevents exceeding the allowed time?~~

How is the storage of combustibles controlled to ensure that they are not stored in prohibited areas of the facility? -What control or barrier exists that prevents the introduction of combustible material into the facility? ~~Has a "Combustion-Free" zone been established in the facility?~~

~~What barrier or control exists to ensure that combustibles in gloveboxes (where they exist) do not exceed applicable weight limits?~~

~~**1.2 Limiting Conditions for Operations (LCOs) and supporting Surveillance Requirements and acceptance criteria are adequately documented in reviewed and approved work instructions that are consistent with the facility Safety Basis and applicable Safety Evaluation Reports (SERs).**~~

Review Approach

- ~~Are adequate and correct work instructions implementing the Surveillance Requirements established (prepared, reviewed, and approved)?~~ How is the configuration of these documents controlled and maintained?

- ~~Do work instructions for Surveillance Requirements describe the "limitations" beyond which an "Out-of-Tolerance" condition would exist? How are "limitations" defined for "Planned Out-of-Tolerances"?~~

- Are the acceptance criteria for Surveillance Requirements documented in appropriate work instructions? ~~Are they consistent with the corresponding SER? How has this been verified?~~

- ~~Are Violations, Out-of-Tolerance Conditions, Emergency Evacuations, and Return to Service situations covered by adequate work instructions?~~

- ~~Are safety system instruments and other measuring devices which monitor TSRs monitored for calibration?~~ What controls are established to ensure proper calibration is maintained for TSR-related measuring devices?

- ~~Describe the Safety Basis controls established for the movement and control of Material-at-Risk (MAR). How have these controls been incorporated in MAR-related work instructions? How will "holdup" in the facility be handled during D&D as it relates to MAR?~~ How often is the building MAR reconciled?

~~**Objective 2:** ***Verify that facility personnel are knowledgeable of Safety Basis controls and requirements.***~~

Criteria:

2.1 Training and Qualification programs for facility and building managers, operations support, and operations personnel have been established, documented, and implemented. ~~**The programs cover the range of duties required as a result of the facility Safety Basis implementation.**~~

~~**Review Approach**~~

- ~~Are USQ evaluators trained and qualified on the new Safety Basis? If USQ screens were used in the determination of procedures needing changes for the new Safety Basis, what~~

~~process and what requirements were the evaluators trained on? Is the training documented?~~

- ~~Describe the documented training program in place that establishes Safety Basis-related training requirements for personnel assigned to the facility or working in the Building(s).~~ What controls are implemented to ensure that only trained workers are permitted to conduct activities in the facility? ~~Are training records current and used? Do training records reflect Safety Basis-related training? Do they reflect requirements for USQ evaluators? Is there a continuing training program that treats Safety Basis-related aspects?~~

- ~~How are support services personnel screened for required Safety Basis-related training? How are subcontractors' employees working in the facility trained in Safety Basis and other activity requirements?~~ How do you ensure that new personnel receive the appropriate training prior to work in the facility?

- ~~Describe the requirements that apply and the training provided to personnel assigned to stand fire watches.~~

- ~~Are facility, support organization, and subcontractor personnel aware of Safety Basis-related facility functions, assignments, responsibilities, and reporting relationships?~~

- Does documented evidence exist to confirm that facility response personnel are current in their training?

~~2.2 Level of knowledge of the Safety Basis controls and of proper response to credible scenarios is adequate.~~

Review Approach

- ~~Do interviews of operations personnel indicate proper understanding of the purpose and use of the Safety Basis controls?~~

- ~~Do table-top exercises of credible scenarios involving use of the Safety Basis controls indicate adequate knowledge of proper response to the scenarios?~~

~~2.3 Training has been performed and documented to the latest revision of the facility Safety Basis and its implementing work instructions.~~

~~Objective 3: *Verify that Safety Basis controls and requirements have been implemented*.~~

~~Criteria:~~

~~3.1 Administrative Controls and associated surveillance requirements established through the Safety Basis are implemented or can be implemented in applicable facilities and programs.~~

Review Approach

- Is there adequate documented evidence that periodic inspections have been conducted to detect degraded drums, cans, and bottles containing radioactive material?
- ~~Does a walkdown of the facility indicate that containers requiring venting are identified and any required venting and purging are performed?~~
- ~~Does documentation exist to demonstrate that the facility tracks chemicals and hazardous waste substances within the facility? Is a current inventory available? How is it maintained current? Are quantities below regulatory thresholds? Are changes to the inventory compared to the inventory used as part of the Safety Basis document hazards analysis?~~
- Does a walkdown of the facility indicate that the chemical management program is adequately implemented?
- ~~Does documented evidence exist to demonstrate that surveillance requirements are being met?~~

~~3.2 There are sufficient numbers of qualified personnel to support the safe implementation of the controls established through the Safety Basis.~~

~~Review Approach~~

- ~~How has the minimum staffing been established to ensure sufficient support for the implementation of Safety Basis controls? How will you know if staffing is not sufficient to ensure controls are being implemented? What actions would be taken?~~
- ~~Are the training functions sufficiently staffed to ensure Safety Basis-related training is maintained current?~~

~~3.3 LCOs and associated Surveillance Requirements established through the Safety Basis are implemented or can be implemented in applicable complex facility programs.~~

~~Review Approach~~

- ~~Can documented and objective evidence be provided to demonstrate the scheduling and tracking of LCO- and AC-related SRs? How have "grace periods" been applied?~~ Is documented and objective evidence available to demonstrate the scheduling and tracking of AC-related Surveillance Requirements? ~~How are "grace periods" applied to AC-related surveillance requirements? Can "grace periods" be compounded?~~
- During the observation of the surveillance process, does the operator take appropriate actions to follow Conduct of Operations?

- ~~Is documented and objective evidence available to demonstrate that the facility has established an adequate baseline of the results of LCO and AC Surveillance Requirements?~~

~~**Objective 4:** ***Verify that safety systems and/or design features are consistent with the Safety Basis***.~~

~~**Criteria:**~~

~~**4.1 Safety systems and/or design features are installed that are consistent with the descriptions and functions provided in the Safety Basis.**~~

~~**Review Approach**~~

- ~~Does a walkdown of the safety systems and/or design features indicate that the installed systems are consistent with the descriptions and functions provided in the Safety Basis?~~

~~**Form 2**~~
~~**Implementation Verification Review (IVR) Checklist**~~

~~**Section 1. Checklist**~~		
~~**Change ________________ DSA Revision_______________**~~ ~~**Date of Performance ________________**~~		
~~**Review the following categories of documents.** Attach a list of reviewed documents affected by the Safety Basis change, and verify adequacy of implementation for each affected document.~~ ~~Any significant issues identified during the review verification that could impact compliance with the Safety Basis are to be immediately brought to the facility manager's attention.~~		
~~**Document Category**~~	~~**Adequately Implemented?**~~	~~**Full Independent Review Required?**~~
~~Technical Safety Requirements~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Conditions of Approval~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Operations Orders~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Operations & Maintenance Procedures~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Shift Orders~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Instructions~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Drawings and Other Design Documents~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Surveillance Requirements Matrix~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Training Documents~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~
~~Specific Administrative Controls~~	~~yes / no~~ ~~NA Intl./date~~	~~yes / no~~ ~~NA Intl./date~~

~~**Form 2**~~
~~**Implementation Verification Review (IVR) Checklist, continued**~~

~~**Section 2. Verify Training**~~
~~**Change/Revision/Date of Performance**~~
~~Have the facility's operations and support personnel been formally briefed about the Safety Basis change? Yes ☐ No ☐~~ ~~Attach a copy of the training roster to the checklist. (Optional)~~ ~~Is the training material, including records and training conducted, current/appropriate for the Safety Basis change? Yes ☐ No ☐~~
~~**Section 3. Certificate of Checklist Completion**~~
~~I/We certify that we have completed the IVR Safety Basis Change Checklist above applicable to the facility Safety Basis.~~ • ~~All applicable checklist criteria and checklist questions use most currently available information and review techniques.~~ • ~~This change has been reviewed against existing Safety Basis documentation, Standing Orders, Procedures, Operations Orders, Shift Orders, Facility Status Board, Systems Evaluation Reports, drawings, instructions, Job Hazard Analyses, Work Packages, and the Surveillance Requirements Matrix.~~ • ~~Items found to be in conflict with the Safety Basis change as identified in the checklist have been fully resolved or corrective actions have been identified. Furthermore, I/we have verified that the appropriate personnel have been provided training to implement the Safety Basis change.~~ • ~~Requirements have been implemented in appropriate facility work instructions or safety management program documentation.~~ • ~~Safety Basis change is verified to be implemented within the facility Safety Basis.~~ ~~Team Leader / Organization / Date~~ ~~Team Member / Organization / Date~~ ~~Team Member / Organization / Date~~ ~~Team Member / Organization / Date~~

~~5.1.1.1.1.1~~

~~**Form 3**~~
~~**Implementation Verification Review Plan**~~

~~The following is a template that can be used for IVR Plans.~~

~~**INTRODUCTION/BACKGROUND**~~
~~Provides background information concerning the new or modified Safety Basis document, new hazards, and issues associated with the Safety Basis implementation to be reviewed.~~

~~**SCOPE OF THE IVR**~~
~~Identifies the Safety Basis controls whose implementation will be verified including the breadth and depth of the review.~~

~~**IVR PREPARATIONS**~~
~~Identifies individuals or team members and describes any IVR preparations, including pre-review activities, document reviews, development of CRADs, etc., that will be undertaken prior to the formal start of the IVR. A discussion of training considerations for reviewers should appear here.~~

~~**IVR REVIEW PROCESS**~~
Describes the review approach including use of checklists or a Criteria Review and Approach Document (CRAD), team meetings, and daily reporting expectations.

Describes the mechanism for the IVR-related meetings, correspondence, communications, team structure, etc., of the review. -The team composition/organization, interface requirements, any oversight groups, and DOE organizations to be involved in the review should be discussed in this section.

~~**REPORTING AND RESOLUTIONS**~~
~~Details the methods that the team will use to report IVR results. These elements include documentation of the IVR results, including good practices, findings, and observations, lessons learned from the review, and the IVR Final Report.~~

SCHEDULE
A discussion of the proposed schedule for conduct of the review, report preparation, and closeout.

~~**APPENDICES**~~
~~Include reporting forms, CRADs, Lines of Inquiry (LOI), Lessons Learned from previous IVRs, resumes or summary of team member's relevant experience, and other sections appropriate to stand alone in an Appendix.~~

~~**Form 4**~~
~~**Surveillance Requirements (SR) Checklist**~~

~~A Surveillance Requirements (SR) verification checklist can be prepared for each new or modified SR or SAC requiring a surveillance/inspection in a facility Safety Basis document to support verification that affected Standards (those that operate, maintain, or provide surveillance to equipment that are in or supporting safety SSCs) have been mapped to their respective Safety Basis document. Initials and date indicate that the Standard and step used are accurate for the Standard identified to meet the surveillance requirements and have been verified. The checklist is to include surveillances performed for passive design features that are subject to degradation. See the example checklist below.~~

~~A similar checklist should be developed to map facility SACs or other administrative controls that include implied surveillance or control requirements to their implementing Standards. An example of this is the surveillance of Maximum Anticipated Quantities (MAQs) or the combustible control program and the associated periodic inspections.~~

~~**SR 4.3.1**~~	~~**Facility XYZ Criticality Accident Alarm System**~~				
~~**SR**~~		~~**Frequency**~~	~~**Standard**~~	~~**Standard Step**~~	~~**Verified by:**~~
~~**4.3.1.1**~~	~~Test each detector to verify response to a neutron source and an alarm state for the detector is received.~~	~~Once per month~~	~~YXX-ZZ-AA~~	~~X.Y.Z [a], "Detector Test"~~	______ ~~Init/date~~

~~Form 5~~
~~SAC Implementation Review Criteria~~

~~The following criteria~~ may be useful in supporting review of the implementation of SACs.

1. There is clear linkage from the SAC implementing procedure(s) to the TSR and its safety function.

2. ~~Formulation of the SAC is such that facility operators can perform the task(s) called for in the SAC within the time frames and under the conditions assumed in the TSR/DSA considering:~~

    - the adequacy of the description of the task(s) in the SAC implementing procedures;
    - the level of difficulty of the task(s);
    - operator training and capabilities;
    - ~~the design of the equipment and feedback indicators and available information, (e.g. indicators and alarms);~~
    - the time available to perform the task(s) and to recover from errors; and
    - actual facility conditions and stress levels caused by or complications created by work constraints or the work environment ~~(e.g., donning PPE, obtaining required approvals, security requirements, noise levels, heat/humidity, accessibility, and availability of communications equipment).~~

3. ~~Changes to SAC requirements, documents, and instrumentation and controls and support equipment are adequately designed, reviewed, approved, implemented, tested, documented, and effectiveness is verified or validated by individuals or groups other than those who performed the work. Verification and validation work is completed before approval and implementation of the SAC.~~ Only the current approved versions of SAC procedures are used.

4. Facility personnel responsible for implementing the SAC have been fully trained and qualified on SACs in general and specifically on the SAC being implemented. ~~This includes training of qualified observers (e.g., performing independent verifications).~~ SAC re-qualification requirements and associated frequencies are defined, adequate, and met.

5. Facility operating processes, protocols, and procedures do not allow the facility to operate in modes or under conditions where the SAC is required~~, but has not been confirmed to be operable. Confirmation of SAC operability during required modes of operation is documented.~~

6. ~~SACs should be evaluated against the guidance in DOE-STD-1186-2004. In particular, the effectiveness of SACs should be evaluated against the measures outlined in Section 3~~

~~of that Standard .~~ SACs that do not contain at least one or more of the recommended attributes would generally be considered inadequate.